

A TAXONOMIC REVISION OF THE GENUS *CLERODENDRUM* L. (VERBENACEAE)* IN AUSTRALIA

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Abstract

A taxonomic revision of *Clerodendrum* in Australia is presented. The following ten species are recognised: *C. costatum*, *C. floribundum*, *C. grayi*, *C. heterophyllum*, *C. inerme*, *C. longiflorum*, *C. parvulum*, *C. tatei*, *C. tomentosum* and *C. tracyanum*. Described as new are *C. grayi* and *C. longiflorum* var. *glabrum* (from Queensland). *C. longiflorum* and *C. heterophyllum* var. *baueri* f. *angustifolium* are recorded from Australia for the first time. *C. costatum* is reinstated as the oldest valid name for the species currently named *C. cunninghamii*. *C. populneum* is placed in the synonymy of *C. floribundum* var. *ovatum*. A new combination of *C. tatei* (based on *Strobilanthus tatei* F. Muell.) is made and *C. holtzei* is placed in its synonymy. *C. lanceolatum* is relegated to the rank of a variety under *C. tomentosum*. The following nine taxa are typified: *C. costatum*, *C. cunninghamii*, *C. floribundum* var. *floribundum*, *C. floribundum* var. *coriaceum*, *C. floribundum* var. *ovatum*, *C. tatei*, *C. tomentosum* var. *lanceolatum*, *C. tomentosum* var. *mollissima* and *C. tracyanum*. In the case of the non-endemic species a range of material including specimens from Malesia was examined.

Affinities and distribution are considered for the genus and each species. A key to the species and infraspecific taxa is provided and a detailed description of each species is supplemented by a habit sketch of a flowering branch and analytical drawings of the flowers.

Taxonomic History of the Genus

The genus *Clerodendrum* was described by Linnaeus (1753) with one species, *C. infortunatum*, the type of which came from India. It was placed in "Didynamia Angiospermia" where it was retained by P. Browne (1756), Burman (1768), Murray (1774), Reichard (1778), Thunberg (1784), Loureiro (1790), Gmelin (1791), Schreber (1791), Persoon (1797, 1807), Willdenow (1800, 1809), Lamarck (1823), Sprengel (1825), Roxburgh (1832), Blanco (1837), Dietrich (1842) and a few others. In 1763, Adanson changed the latinised form of the genus, as originally published, to an all Greek form "*Klerodendron*" p. 12 or "*Clerodendron*" p. 199 as also used by most subsequent authors of the eighteenth-, nineteenth- and early twentieth centuries (see citations under the genus). A return to the original spelling was initiated by the various publications of Moldenke from 1942 onwards, and was generally accepted by subsequent authors. Adanson (1763) placed the genus in "Verbenae", Gleditch (1764) in "Petalostemonum", Rueling (1774) in "Ringentes Halleriae", Scopoli (1777) in "Personatae", Jessieu (1789) in "Vitices", Necker (1790) in "Plasyrgophytum", Giseke (1792) and Batsch (1802) in "Personatar", Ventenat (1799) in "Pyrenaceae", and Reichenbach (1828) under the tribe "Verbeneae" in the Labiatae. In 1805, Jaume Saint-Hilaire proposed the family Verbenaceae for *Clerodendrum* and other related genera, a concept accepted by subsequent botanists.

Jaume Saint-Hilaire (1805) distinguished three sections in the family Verbenaceae: first section with flowers opposite on a branched corymb, second section with flowers arranged in alternate spikes and third section with genera which have some affinity with the Verbenaceae. In this arrangement, *Clerodendrum* was placed in the first section.

In 1829, Dumortier divided the Verbenaceae into two tribes based on their bracteoles being alternate or opposite in Verbeneae and Viticeae respectively with *Clerodendrum* in the

*The present treatment of the genus *Clerodendrum* is the seventh in the series of taxonomic revisions in the family Verbenaceae in Australia (see Munir, 1982, 1984a, 1984b, 1985, 1987a, 1987b).

tribe Viticeae. This tribe was accepted for the genus by Bartling (1830), Bentham (1870, 1876), Spach (1840), Schauer (1847), Walpers (1852), Miquel (1858), Bailey (1883, 1901, 1913), C.B. Clarke (1885), Durand (1888), Post & Kuntze (1904), King & Gamble (1909), Ewart & Davies (1917), Ridley (1923), Fletcher (1938), Lemée (1943) and others. The above-named tribes were called "sections" by Bartling (1830) and Spach (1840).

In 1838, Endlicher divided the family Verbenaceae into three tribes: Lippieae with fruit drupaceous but splitting at maturity, Lantaneae with fruit drupaceous but indehiscent, and Aegiphileae with fruit a berry. In this system, *Clerodendrum* was placed in the tribe Lantaneae. This tribe was accepted for the genus by Meisner (1840), Endlicher (1841), Brongniart (1843), Dietrich (1842) and Walpers (1845). Schauer (1847) re-classified the Verbenaceae into three tribes: Verbeneae, Viteae and Avicenniae. He based the tribe Verbeneae on its inflorescence being indeterminate, ovules erect, anatropous, attached at the base of the locule; Viteae on inflorescence definite, ovules pendulous, amphitropous or subanatropous, attached to the central axis above the base, and Avicenniae on inflorescence capitate, ovules paired, pendulous, amphitropous, attached to the apex of the axis.

He subdivided the tribe Viteae into three subtribes: Symphoremeeae with cymes involucred and contracted to few flowers, capsule coriaceous and indehiscent, twining shrubs from eastern India; Caryopterideae with cymes without involucre, mature capsule dividing into 4-valves, shrubs from Asia; Viticeae with cymes without involucre, drupe juicy, succulent, spongy-tuberous, very rarely hard nut-like, trees or shrubs. In this classification, *Clerodendrum* was placed in the subtribe Viticeae. Later the subtribe Viticeae, as "Euviticeae", was accepted by Miquel (1858) and Bentham (1870). Miquel (1858) based the subtribe "Euviticeae" on its inflorescence being without involucre; corolla regular or two-lipped; drupe rarely nut-like, seated on or enclosed by the enlarged calyx. On the other hand, Bentham (1870) characterized the subtribe "Euviticeae" on its ovary being not at all or scarcely lobed; fruit a drupe; shrubs or trees; seeds without albumen. In 1895, Briquet re-classified the Verbenaceae and upgraded the tribe Viticeae to a subfamily Viticoideae. The latter was subdivided into four tribes largely based on the type of drupe and the corolla being zygomorphic in the tribes Viticeae and Clerodendreae. This classification was adopted by Dalla Torre & Harms (1904), H.J. Lam (1919), Junell (1934), Moldenke (1959, 1971), Lopez-Placios (1977) and several other botanists. Post & Kuntze (1904), however, did not accept Briquet's (1895) above classification and relegated the subfamily Viticoideae to the synonymy of the tribe Viticeae.

Schauer (1847) also divided the genus into two sections: *Euclerodendron* and *Siphonanthus*, based chiefly on the shape of corolla, length of corolla-tube and the arrangement of corolla-lobes. The section *Euclerodendron* was further subdivided into six subsections: *Axilliflora*, *Penduliflora*, *Racemiflora*, *Densiflora*, *Paniculata* and *Squamata*. Schauer's (1847) sections and subsections of the genus were accepted by Miquel (1858). C.B. Clarke (1885) called both the above sections as two subgenera of the genus. In the above mentioned Briquet's (1895) treatment of the Verbenaceae, he too subdivided the genus *Clerodendrum* into five sections: *Volkameria*, *Euclerodendron*, *Cyclonema*, *Cornacchinia* and *Siphonanthus*, each characterised chiefly by the shape and length of corolla-tube, disposition of corolla-lobes and the arrangement of stones in the fruit. These sections are based on genera previously recognised but now included in the large variable genus *Clerodendrum*. Briquet also accepted Schauer's (1847) subdivision of the section *Euclerodendron* into above named six subsections. These sections and subsections were adopted by Dalla Torre & Harms (1904). The majority of botanists, however, have not divided the genus into sections and subsections, but have retained it in the Verbenaceae without reference to any subfamily or a tribe. Since most recent taxonomist worked on a regional flora, comments on the higher classification of a pantropical genus cannot be ventured. The study of the few Australian species does not allow speculation on the supra- and infra- generic structure of the genus. It is, however, unfortunate that Moldenke in his various summaries of the Verbenaceae has not given a lead in this matter.

Australian History of the Genus

The first Australian records of *Clerodendrum* were collected by Banks and Solander during 1770 from northern Queensland. Then more specimens were collected by Robert Brown during 1802-1805 from New South Wales, Queensland and Northern Territory. All these collections were identified by Robert Brown (1810) as eight species namely *C. tomentosum* (Vent.) R. Br., *C. medium* R. Br., *C. attenuatum* R. Br., *C. floribundum* R. Br., *C. ovatum* R. Br., *C. coriaceum* R. Br., *C. costatum* R. Br. and *C. inerme* (L.) Gaertner. He thus described six new species. Later, *C. medium* was found to be synonymous with *C. tomentosum* (Vent.) R. Br. and *C. attenuatum*, *C. ovatum* and *C. coriaceum* were relegated to varieties of *C. floribundum*.

In 1847, Schauer placed all of Robert Brown's new *Clerodendrum* species from Australia under "Species denuo recognoscendae". He did not elaborate on their short original descriptions, nor cite any plant collection from Australia. In addition he recorded *C. tomentosum* from Australia. In 1863, F. Mueller described the two new species, *C. cardiophyllum* from Northern Territory and *C. lanceolatum* from Western Australia. Domin (1928) seems to have included the former species in the synonymy of *C. floribundum*; the latter is being regarded here as a narrow-leaved variety of *C. tomentosum*. In 1865, F. Mueller described *Premna tracyana* F. Muell. from Queensland which Bentham (1870) transferred to *Clerodendrum*. Subsequently, F. Mueller (1868, 1875) listed from Australia respectively three and two *Clerodendrum* species of which *C. linnaei* F. Muell. and *C. hemiderma* F. Muell. were later found to belong to the genus *Glossocarya* Wall. ex Griffith which is distinguished by the capsular fruit and non-accrecent calyx. Thus they were transferred by Bentham (1876) to the genus *Glossocarya* as *G. hemiderma* (F. Muell.) Benth.

In 1870, Bentham published a complete account of the Australian Verbenaceae, and listed eight *Clerodendrum* species, viz. *C. hemiderma* F. Muell., *C. inerme* (L.) Gaertner, *C. tracyanum* (F. Muell.) Benth., *C. tomentosum* (Vent.) R. Br., *C. lanceolatum* F. Muell., *C. floribundum* R. Br., *C. cunninghamii* Benth. and *C. costatum* R. Br. Of these *C. cunninghamii* Benth. was described as new and *C. tracyanum* (F. Muell.) Benth. was a new combination. For the first time, Bentham (1870) provided keys to the Australian Verbenaceae genera and their species. He also listed under *C. floribundum* R. Br. five doubtful species, namely *C. attenuatum* R. Br., *C. medium* R. Br., *C. ovatum* R. Br., *C. cardiophyllum* F. Muell. and *C. coriaceum* R. Br. These were considered by him as variants of *C. floribundum* R. Br. Nevertheless, the occurrence of these species in Australia was recorded by F. Mueller (1882a, 1889) and Bailey (1883, 1901, 1913). In 1882, F. Mueller (1882b) mistook a new *Clerodendrum* collection from Northern Territory as acanthaceous, and described it as *Strobilanthus tatei* F. Muell. F. Mueller (1891) described *C. holtzei* based on a collection of the same species and from the same area.

In their posthumous publication, Banks & Solander (1901), described one of their 1770 collection from Queensland as *Siphonanthus floribundus* which has now been placed into the synonymy of *C. longiflorum* Decne. var. *glabrum* Munir. Ewart & Davies (1917) listed five species from Northern Territory, Gardner (1931) three species from Western Australia and Anderson (1947) three species from New South Wales. Moldenke (1952) recorded for the first time *C. heterophyllum* (Poir.) R. Br. from Queensland, and L.S. Smith (1969) described *C. parvulum* from the same State. Subsequently, Beadle (1984) reported two species from north-eastern New South Wales and Stanley (1986) four species from south-eastern Queensland. All the above named taxa described by Robert Brown, F. Mueller, Bentham and others were enumerated for Australia by Moldenke (1959, 1971, 1980). Presently, the known *Clerodendrum* species in Australia are only ten (10) with nine infraspecific taxa.

Chromosome number

No cytological investigations of any of the Australian species of *Clerodendrum* have been done. All available chromosome counts are reported from species found outside Australia

except *C. inerme* (L.) Gaertner of which the known chromosome count ($2n = 46$) was based on material from outside Australia. In a review of the cytotaxonomy of the family Verbenaceae, Sharma and Mukhopadhyay (1963) reported that the haploid numbers so far recorded in the genus *Clerodendrum* are 12 and 23, but the counts show a wide range of chromosome numbers from 24 to 184. The lowest number ($2n = 24$) has been recorded for *C. aculeatum* (L.) Schlecht., *C. trichotomum* Thunb. var. *fargesii* (Dode) Rehd. (= *C. fargesii* Dode) and *C. scandens* P. Beav. (= *C. umbellatum* Poir.), and the highest ($2n = 184$) for *C. ugandense* Prain. (Darlington & Wylie 1955, Sharma & Mukhopadhyay 1963, Fedorov 1974). In addition, Choudhry & Roy (1983) reported a range of aneuploid numbers which can, however, be derived from the above base numbers. The lack of any counts from Australian collections and the wide range of numbers recorded indicate the need for work on the Australian taxa.

CLERODENDRUM L.

Clerodendrum L., Sp. Pl. 2 (1753) 637; Gen. Pl. edn 5 (1754) 285;

Adans., Fam. Pl. 2 (1763) 12 — "Klerodendron"; ib. (1763) 199 — "Clerodendron"; Burm. f., Fl. Indica (1768) 137; L., Mant. Pl. 2 (1771) 90; Murray, Syst. Veg. edn 13 (1773) 483; Scop., Intr. Hist. Nat. (1777) 170; Reichard, Gen. Pl. (1778) 327 — "Clerodendron"; Thunb., Fl. Jap. (1784) 256; Gaertner, Fruct. Sem. Pl. (1788) 271, t. 57 f. 1; A.L. Juss., Gen. Pl. (1789) 106; Lour., Fl. Cochinch. 2 (1790) 387; Schreber, Gen. Pl. 2 (1791) 426 — "Clerodendron"; Pers., Syst. Veg. (1797) 615; Vent., Tabl. Régn. Vég. 2 (1799) 316; Willd., Sp. Pl. 3 (1800) 386; A.L. Juss., Ann. Mus. Nat. Hist. Paris 7 (1806) 74; Pers., Syn. Pl. 2 (1807) 145; Willd., Enum. Pl. Hort. Reg. Bot. Berl. (1809) 658; R. Br., Prodr. Fl. Nov. Holl. (1810) 510; Kunth, Syn. Pl. 2 (1823) 39; Lam., Tabl. Encycl. 3 (1823) 56; Sprengel, Syst. Veg. 2 (1825) 758 — "Clerodendron"; Blume, Bijdr. Fl. Neth. Ind. (1826) 807; Dumort., Anal. Fam. Pl. (1829) 22 — "Clerodendron"; Bartling, Ord. Nat. Pl. (1830) 180 — "Clerodendron"; Sprengel, Gen. Pl. 2 (1831) 479 — "Clerodendron"; Roxb., Fl. Ind. 3 (1832) 57; Endl., Gen. Pl. 1 (1838) 637 — "Clerodendron"; Benth., Ann. Nat. Hist. 2 (1839) 450 — "Clerodendron"; Meissner, Pl. Vasc. Gen. Vol. 1, "Tab. Diag." (1840) 291; Vol. 2 "Commentarius" (1840) 200 — "Clerodendron"; Steudel, Nomencl. Bot. (1840) 382; Brongn., Enum. Pl. Mus. Paris (1843) 65 — "Clerodendron"; Walp., Repert. Bot. Syst. 4 (1845) 102 — "Clerodendron"; Schauer in A. DC., Prodr. 11 (1847) 658 — "Clerodendron"; Walp., Annal. Bot. Syst. 3 (1852) 238 — "Clerodendron"; Miq., Fl. Ind. Bat. 2 (1858) 867 — "Clerodendron"; Benth., Fl. Aust. 5 (1870) 60 — "Clerodendron", excl. *C. hemiderma* F. Muell.; Pfeiffer, Nom. Bot. 1 (1873) 784 — "Clerodendron"; Benth. in Benth. & Hook.f., Gen. Pl. 2 (1876) 1155 — "Clerodendron"; F. Muell., Syst. Cens. Aust. Pl. 1 (1882) 103; C.B. Clarke, Fl. Brit. Ind. 4 (1885) 589 — "Clerodendron"; Maxim., Bull. Acad. Sc. St. Petersb. 31 (1887) 83; F. Muell., Sec. Syst. Cens. Aust. Pl. 1 (1889) 173, excl. syn. *Glossocarya*; Kuntze, Revis. Gen. Pl. part 2 (1891) 505 — "Clerodendron"; Briq. in Engl. & Prantl, Pflanzenfam. 4, 3a (1895) 174 — "Clerodendron"; Bailey, Qld Fl. 4 (1901) 1181 — "Clerodendron"; T. Post & Kuntze, Lexic. Gen. Phan. (1904) 688; King & Gamble, Mat. Fl. Malay Penins. 4 (1909) 825 — "Clerodendron"; Bailey, Comp. Cat. Qld Pl. (1913) 386 — "Clerodendron"; Ewart & Davies, Fl. N. Terr. (1917) 238 — "Clerodendron"; H.J. Lam, Verbenac. Malay. Archip. (1919) 239 — "Clerodendron"; Bakh., Bull. Jard. Bot. Ser. III, 3 (1921) 73 — "Clerodendron"; Ridley, Fl. Malay. Penins. 2 (1923) 623 — "Clerodendron"; Péi, Verbenac. China (1932) 122 — "Clerodendron"; Junell, Symb. Bot. Upsal. 4 (1934) 100 — "Clerodendron"; Lemée, Dict. Descr. Syn. Gen. Pl. Phan. 8b (1943) 657 — "Clerodendron"; Mold., Résumé Verbenac. etc. (1959) 411; N. Burb., Dict. Aust. Pl. Gen. (1963) 74; Baker & Bakh. f., Fl. Java 2 (1965) 607; Mold., Fifth Summary Verbenac. etc. 2 (1971) 760; Farr et al., Index Nomin. Gen. 1 (1979) 384; Baines, Aust. Pl. Gen. (1981) 97, excl. syn. *C. hemiderma*; Mold. in Dassan. & Fosb., Fl. Ceylon 4 (1983) 407; Mod., Phytologia 58 (1985) 178; Stanley in Stanley & Ross, Fl. S.E. Qld 2 (1986) 369.

Type species: C. infortunatum L.

Ovieda L., Sp. Pl. 2 (1753) 637; Gen. Pl. edn 5 (1754) 284; Gaertner, Fruct. Sem. Pl. (1788) 272; Murray, Syst. Veg. edn 13 (1774) 483; Reichb., Consp. Reg. Veg. (1828) 117; Vent., Tabl. Régn. Vég. 2 (1799) 317, non K.P.J. Sprengel 1817.

Type species: O. spinosa L.

Volkameria L., Sp. Pl. 2 (1753) 637; Gen. Pl. edn 5 (1754) 284; Mant. Pl. (1771) 90; Jacq., Select. Stirp. Amer. Hist. (1763) 185; Burm. f., Fl. Ind. (1768) 136; Gaertner, Fruct. Sem. Pl. (1788) 267; Schreber, Gen. Pl. 2 (1791) 425; Lam., Tabl. Encycl. 3 (1823) 56; Dumort., Anal. Fam. Pl. (1829) 22; Meissner, Pl. Vas. Gen. Vol. 1 "Tab. Diag." (1840) 291; Vol. 2 "Commentarius" (1840) 200; Murray, Syst. Veg. edn 13 (1774) 483; Necker, Elem. Bot. 1 (1790) 384; Pers., Syn. Pl. 2 (1807) 144; Reichb., Consp. Reg. Veg. (1828) 117; Scop., Intr. Hist. Nat. (1777) 169; Spach, Hist. Nat. Veg. 9 (1840) 226; Vent., Tabl. Régn. Vég. 2 (1799) 317; Willd., Enum. Pl. (1809) 658; Walp., Repert. Bot. Syst. 4 (1845) 99; Schauer in DC., Prodr. 11 (1847) 656, non P. Browne 1756.

Type species: V. aculeata L., lectotype.

Siphonanthus L., Sp. Pl. 1 (1753) 109; Gen. Pl. edn 5 (1754) 47.

Type species: S. indicus L.

Douglassia Miller, Gard. Dict. edn 4 (1754); Adans., Fam. Pl. 2 (1763) 200, non Schreber 1791, nec Reichb. 1828, nec. Lindl. 1829, nec. Heist 1973.

Type species: D. frutescens Miller.

Cryptanthus Osbeck, Dagb. Ostind. Resa (1757) 215, non Nutt. 1849, nor Otto & Dietr. 1836.

Type species: C. chinensis Osbeck.

Valdia Plum. ex Adans., Fam. Pl. 2 (1763) 157, nom. superfl., with *Ovieda* L. quoted in its synonymy.

Bellevalia Scop., Introd. Hist. Nat. (1777) 198, non Delile 1836, nec Lepyr 1808, nec Roem. & Schult. 1819.

Type species: non designatus.

Montalbania Necker, Elem. Bot. 1 (1790) 273, nom. illeg.

Volkmannia Jacq., Pl. Rar. Hort. Schoenbr. 3 (1798) 48, t. 338, non Sternb. 1825.

Type species: V. japonica Jacq.

Agricolaea Schrank, Denkschr. Königl. Akad. Wiss. München (1809) 98.

Type species: A. fragrans Schrank.

Torreya Sprengel, Neue Entdeck. 2 (1821) 121, non Raf. 1818 & 1819, nec Eaton 1829, nec Arn. 1838, nec Croom 1843.

Type species: T. paniculata Sprengel.

Cornacchinia Savi, Mem. Mat. Fis. Soc. Ital. Sci. Modena 21 (1837) 184, t. 7, non Endl. 1841.

Type species: C. fragiformis Savi.

Egena Raf., Fl. Tellur. 2 (1837) 85.

Type species: E. emirnenis (Bojer ex Hook.) Raf., loc. cit. 2 (1837) 85, based on *Clerodendron emirnense* Bojer ex Hook., Bot. Mag. New Ser. 3 (1829) t. 2925.

Rothea Raf., Fl. Tellur. 4 (1838) 69.

Type species: non designatus; R. bicolor Raf., loc. cit. 4 (1838) 69, lectotype, here designated.

Cyclonema Hochst., Flora 25 (1842) 225.

Type species: non designatus, C. myricoides Hochst., Flora 25 (1842) 226, lectotype, here designated.

Spiroema Hochst., Flora 25 (1842) 226, nom. nud.

Cyrtostemma Kunze, Bot. Zeit. 1 (1843) 272, non Spach 1841.

Type species: C. myricoides Kunze.

Cleianthus Lour. ex Gomes, Mem. Acad. Ci. Lisboa, Cl. Sci. Mor. Pol. Bel.-Let., Ser. 2, 4 (1868) 28.

Type species: non cognitus.

Shrubs, small trees or woody climber, rarely herbs. *Stem* and branches almost terete or obscurely tetragonal. *Leaves* simple, decussate-opposite, entire or variously dentate, exstipulate, reticulate-veined, unicastate, petiolate or sessile. *Inflorescence* cymose; cymes mostly loose-flowered or capitate, pedunculate, usually forming terminal, or rarely axillary, corymbose or thyrsoid panicles. *Flowers* usually large and showy, complete, zygomorphic, bisexual,

hypogynous; bracts small, narrow. *Calyx* of 5 fused sepals, persistent, tubular or somewhat campanulate, variously 5-toothed, 5-lobed or sometimes almost truncate, accrescent and spreading under the fruit. *Corolla* of 5 fused petals, deciduous, tubular below, with nearly equally spreading 5 lobes at the top; tube slender, often much longer than calyx, narrowly cylindrical, straight or incurved. *Stamens* 4, didynamous, usually much exserted, alternate with the corolla-lobes, epipetalous, inserted about the middle of the corolla-tube; filaments filiform; anthers dorsifixed, oblong or elliptic, 2-lobed, lobes parallel or divergent. *Ovary* bicarpellary, syncarpous, 4-locular, with one ovule in each cell, attached to an exile placentation at or above the middle; style terminal, exserted, filiform, glabrous, with 2 short stigmatic lobes. *Fruit* drupaceous, globose or obovoid, the endocarp separating into 4 one-seeded or rarely into 2 two-seeded pyrenes. *Seeds* exalbuminous.

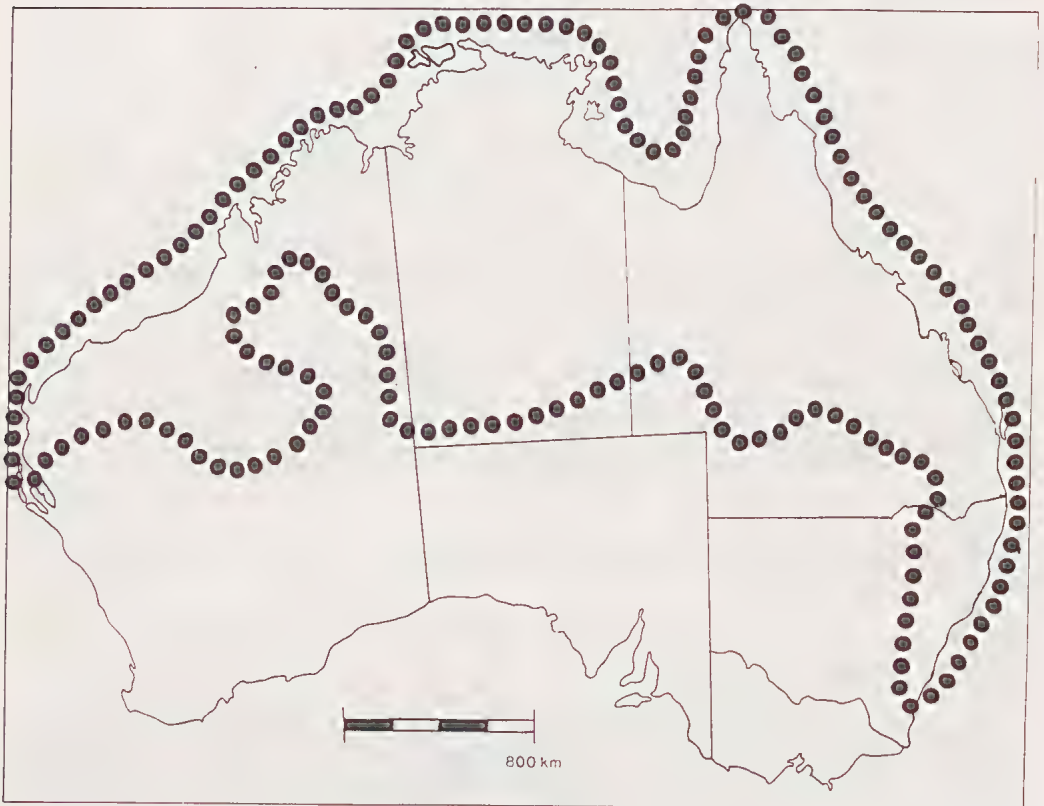
Number of species: World: \pm 584 specific and infraspecific taxa; Australia: 10 species, 7 varieties and 2 forms.

Derivation of name

The generic name is derived from the Greek *kleros*, chance; *dendron*, tree; referring to its uncertain medicinal properties.

Distribution (Map 1)

The genus *Clerodendrum* is widely distributed in the tropical and subtropical regions of



Map 1. Distribution of the genus *Clerodendrum* L. in Australia.

Australia, Asia, Africa, Central and South America and the West Indies. It is poorly represented in North America and Europe except in cultivation and by naturalization.

Of the ten Australian species, three are endemic in Australia and six are also known from Papua New Guinea, Solomon Islands and neighbouring Indonesian Islands. One species, *C. inerme* (L.) Gaertner, is the most widespread of all and has been recorded along the sea coasts from India to Taiwan through Malesia, tropical Australia and Polynesia.

Comments

Clerodendrum is a very complex and the largest genus in the family Verbenaceae. Due to their polymorphic nature different forms of the same species were described in the past as distinct species. During the present investigation, several such taxa have been relegated to infraspecific level. One such example is *C. floribundum* R. Br. with five varieties. All varieties, except var. *angustifolium* were originally described as distinct species.

Moldenke (1971, 1980) recorded three *Clerodendrum* taxa from Queensland namely *C. album* Ridley, *C. umbellatum* Poir. var. *speciosum* (Dombrain) Mold. and *C. viscosum* Vent. So far, no one else has ever recorded these taxa from Australia. Of these three taxa, *C. album* Ridley seems to be a nomen nudum as it is not known to have ever been validly published. Moldenke repeatedly recorded *C. album* Ridley in his publications, but then admitted that: "As yet I have not been able to ascertain where, if at all, Ridley published a description of this taxon, known to me only from herbarium specimens so annotated; apparently previously, at least in one case, distributed as *C. coriaceum* R. Br." [*Phytologia* 57 (1985) 474-475]. In the present publication, therefore, *C. album* Ridley is considered another name attributed to the complex of *C. floribundum* R. Br. The other two taxa recorded from Australia by Moldenke, *C. umbellatum* var. *speciosum* and *C. viscosum*, do not occur here naturally, or in a naturalised form. Moldenke may have recorded these taxa from cultivation, or from herbarium specimens annotated erroneously.

Affinities

Clerodendrum is closely related to *Faradaya* F. Muell. in its inflorescence being cymose and centrifugal; flowers more or less zygomorphic; stamens 4; fruit drupaceous; drupes composed of four (or through abortion less numerous) 1-locular pyrenes. Nevertheless, *Clerodendrum* is easily distinguished by its calyx being open before anthesis, 5-lobed, 5-dentate, without subulate apex, sometimes almost truncate, split into lobes from the beginning; corolla of 5 fused petals; style terminal, not sunken between the ovary lobes.

Clerodendrum is also closely allied to *Gmelina* L. and *Premna* L. in having a cymose and centrifugal inflorescence, zygomorphic flowers, 4 stamens in each flower and drupaceous fruit. However, *Gmelina* and *Premna* can readily be identified by their calyx and corolla being 4- or 5-lobed, corolla-tube mostly much dilated above the calyx, stamens and style scarcely or shortly exerted above the corolla-lobes and drupe composed of one 4-locular pyrenes. The calyx and corolla in *Clerodendrum* are always 5-lobed and stamens and style much exerted.

There are a few characters common between *Clerodendrum* and *Vitex* L. Both have cymose inflorescence, zygomorphic flowers, 5-lobed calyx as well as corolla, 4 stamens in each flower and drupaceous fruit. Nevertheless, *Vitex* may easily be identified by its leaves being digitate, often with 3-7 leaflets, rarely 2 or 1; corolla-tube more or less bilabiate; drupe composed of one 4-locular pyrenes.

Key to species and infraspecific taxa
(Taxa asterisked are new)

- 1a. Leaf-blades pubescent, hirsute or tomentose at least on the lower (abaxial) surface; calyx distinctly pubescent outside11

- b. Leaf-blades glabrous, sometimes sparsely puberulous on abaxial veins; calyx glabrous, sometimes sparsely puberulous outside2
- 2a. Calyx 5-toothed or deeply 5-lobed4
- b. Calyx truncate or shallowly toothed3
- 3a. Leaf-blades elliptic-ovate, not punctate; corolla-tube 15-40 mm long; ovary glandular; scandent shrub 1. *C. inerme*
- b. Leaf-blades narrow elliptic-lanceolate, punctate; corolla-tube 10-15 mm long; ovary non-glandular; non-scandent shrub (not in Australia) 2a. *C. heterophyllum* var. *heterophyllum*
- 4a. Calyx deeply 5-lobed, non-glandular outside; corolla white, non-glandular, glabrous all over; corolla-tube (15-) 20-100 mm long6
- b. Calyx 5-toothed, glandular outside; corolla purple, glandular outside, villous inside the tube; corolla-tube 10-15 mm long5
- 5a. Leaf-blades narrowly elliptic-lanceolate, 10-35 mm wide at the mid-point2b. *C. heterophyllum* var. *baueri* f. *baueri*
- b. Leaf-blades linear, less than 10 mm wide at the mid-point2c. *C. heterophyllum* var. *baueri* f. *angustifolium*
- 6a. Corolla-tube 50-100 mm long; filaments 35-50 mm long; style 65-105 mm long; calyx-lobes 5-8 mm long3. **C. longiflorum* var. *glabrum*
- b. Corolla-tube (15-) 20-45 mm long; filaments 9-35 mm long; style 30-60 mm long; calyx-lobes 2-5 mm long 4. *C. floribundum* 7
- 7a. Petiole, peduncle, pedicel and calyx glabrous9
- b. Petiole, peduncle, pedicel and calyx puberulous-pubescent or pubescent-tomentose8
- 8a. Leaf-blades elliptic or elliptic-lanceolate, up to 130 x 55 mm; petiole, peduncle, pedicel and calyx puberulous; inflorescence more or less lax 4a. *C. floribundum* var. *floribundum*
- b. Leaf-blades elliptic-obovate, up to 175 x 100 mm; petiole, peduncle, pedicel and calyx pubescent-tomentose; inflorescence more or less congested 4b. *C. floribundum* var. *attenuatum*
- 9a. Leaf-blades cordate-subcordate, ovate or almost truncate at the base, coriaceous; inflorescence very lax4c. *C. floribundum* var. *coriaceum*
- b. Leaf-blades ovate, lanceolate or narrow elliptic-lanceolate, rounded or cuneate towards the base, chartaceous or subcoriaceous; inflorescence semi-lax10
- 10a. Leaf-blades ovate, rounded or very broadly narrowing towards the base, generally 35-90 mm wide 4d. *C. floribundum* var. *ovatum*
- b. Leaf-blades lanceolate or narrowly elliptic-lanceolate, long cuneate towards the base, generally 15-30 mm wide 4e. *C. floribundum* var. *angustifolium*
- 11a. Leaves distinctly petiolate, petioles 10-200 mm long; corolla-tube glabrous inside or with a few sparse gland-tipped hairs on the inner upper-half13
- b. Leaves sessile or with minute petioles of 1-3 mm long; corolla-tube villous inside without gland-tipped hairs12
- 12a. Prostrate, decumbent or sub-erect herb or subshrub; leaves variable, cordate, rhomboid-orbicular, ovate-elliptic, oblong or linear-lanceolate, (5-) 10-30 (-40) mm wide; corolla-tube (8-) 12-18 (-25) mm long; stamens and style white; endemic to NNW Northern Territory 5. *C. tatei*
- b. Erect shrub or subshrub; leaves obovate-oblong, elliptic-oblong, oblanceolate to lanceolate, (1.5-) 2-5 (-7) mm wide; corolla-tube 7-10 mm long; stamens and style purple; endemic to Cape York Peninsula, Qld 6. *C. parvulum*
- 13a. Inflorescence not exceeding the upper leaves; flowers small, up to 10 mm long; calyx-and corolla-tubes with sparse gland-tipped hairs inside; filaments 8-12 mm long; style 10-18 mm long 7. *C. tracyanum*
- b. Inflorescence exceeding the upper leaves; flowers larger, 18-70 mm long; calyx-and corolla-tubes glabrous and without gland-tipped hairs inside; filaments (15-) 20-40 mm long; style 30-100 mm long14
- 14a. Flowers in lax pubescent-puberulous thyrses; corolla glabrous or puberulous only outside the lobes, tube 25-70 mm long; style 60-100 mm long17
- b. Flowers in dense tomentose thyrses; corolla pubescent outside, tube 18-25 (-27) mm long; style 30-43 mm long 8. *C. tomentosum* 15
- 15a. Leaf-blade broadly ovate, with almost rounded base, densely velvety-tomentose all over; corolla-tube always villous-tomentose outside8c. *C. tomentosum* var. *mollissima*

- b. Leaf-blades elliptic, elliptic-oblong or lanceolate, with a cuneate-attenuate base, tomentose or pubescent-glabrescent above; corolla-tube villous-tomentose or almost glabrous outside 16
- 16a. Leaf-blades elliptic, elliptic-oblong or broadly lanceolate, pubescent-glabrescent above; corolla-tube sparsely villous-pubescent or almost glabrous outside; calyx glandular and puberulous inside 8a. *C. tomentosum* var. *tomentosum*
- b. Leaf-blades narrow-lanceolate, pubescent-tomentose all over; corolla-tube usually densely villous-tomentose outside; calyx glandular and pubescent-tomentose inside 8b. *C. tomentosum* var. *lanceolatum*
- 17a. Leaf-blades glabrous above, ovate or broadly elliptic-ovate; corolla glabrous, tube non-glandular, 45-70 mm long 9. *C. costatum*
- b. Leaf-blades puberulous above, oblong or narrowly elliptic-oblong; corolla puberulous outside the lobes, tube sparsely glandular outside, 25-40 mm long 10. **C. grayi*

1. *Clerodendrum inerme* (L.) Gaertner, Fruct. Sem. Pl. 1 (1788) 271, t. 57 fig. 1;

R. Br., Prodr. Fl. Nov. Holl. (1810) 511; Sprengel, Syst. Veg. 2 (1825) 758, "Clerodendron"; Blume, Bijdr. Fl. Ned. Ind. (1826) 808; Schauer in A.D.C., Prodr. 11 (1847) 660, "Clerodendron"; Walp., Repert. Bot. Syst. 4 (1845) 112, "Clerodendron"; Miq., Fl. Ind. Bat. 2 (1858) 868, "Clerodendron"; F. Muell., Essay Pl. Fitzal. Smith's Exped. Burdek. (1860) 17, "Clerodendron"; F. Muell., Landsb. Explor. Aust. (1866) 119, "Clerodendron"; F. Muell., Fragm. 6 (1868) 152, "Clerodendron"; Benth., Fl. Aust. 5 (1870) 61, "Clerodendron"; F. Muell., Descr. Notes Papuan Pl. 1 (1875) 11, "Clerodendron"; F. Muell., Syst. Cens. Aust. Pl. 1 (1882) 103; Bailey, Synop. Qld Fl. (1883) 380, "Clerodendron"; C. Moore, Cens. Pl. N.S.W. (1884) 52, "Clerodendron"; C.B. Clarke in Hook.f., Fl. Brit. Ind. 4 (1885) 589; Maxim., Bull. Acad. Sc. St. Petersburg. 31 (1887) 83; Schumann, Fl. Deutsch-Ostas. Schutzgeb. (1887) 200, "Clerodendron"; Bailey, Qld Woods (1888) 92, "Clerodendron"; F. Muell., Sec. Syst. Cens. Aust. Pl. 1 (1889) 173; Watt., Dic. Econ. Prod. India 2 (1889) 372, "Clerodendron"; Bailey, Cat. Qld Pl. (1890) 36, "Clerodendron"; C. Moore, Hanb. Fl. N.S.W. (1893) 357, "Clerodendron"; Bailey, Qld Fl. 4 (1901) 1182, "Clerodendron"; Schumann & Lauterb., Fl. D. Südsee (1901) 525, "Clerodendron"; Dixon, Pl. N.S.W. (1906) 236, "Clerodendron"; Pulle in Lorentz, Nova-Guinea Bot. 8(2) (1910) 402, "Clerodendron"; 8 (4) (1911) 687, "Clerodendron"; Bailey, Compr. Cat. Qld Pl. (1913) 386, "Clerodendron"; Maiden, Cens. N.S.W. Pl. (1916) 178, "Clerodendron"; Ewart & Davies, Fl. N. Territory (1917) 238, "Clerodendron"; H.J. Lam, Verbenac. Malay. Archip. (1919) 251, "Clerodendron"; Bakh. in H.J. Lam & Bakh., Bull. Jard. Bot. Ser. III, 3 (1921) 77, "Clerodendron"; H.J. Lam, Bot. Jahrb. Syst. 59 (1924) 95, "Clerodendron"; Bakh. in Bakh. & H.J. Lam in Nova Guinea 14 (Bot) (1924) 170, "Clerodendron"; Bakh., J. Arn. Arb. 16 (1935) 71, "Clerodendron"; A.D.J. Meeuse, Blumea 5 (1942) 74; Webb, C.S.I.R. Bull. 232 (1948) 168, "Clerodendron"; Specht in Specht & Mountford, Recd. Amer. Aust. Sc. Exped. Arnhem Land 3 (1958) 289, 404, 470; Mold., Résumé Verbenac. etc. (1959) 200, 204, 206-208, 216, 250, 261, 262, 264-267, 301, 391, 392; T. Cooke, Fl. Bombay Pres. 2, 2nd reprint edn (1967) 511; Mold., Fifth Summary Verbenac. etc. 1 & 2 (1971) 273, 282, 299, 304, 315, 322, 330, 332, 335, 340, 343, 345, 359, 441, 442, 447-449, 452, 461, 464, 531, 732-734; Chippendale, Proc. Linn. Soc. N.S.W. 96 (1972) 256; Court, Cat. Pl. Nat. Bot. Gard. Canberra (1980) 81; Mold., Sixth Summary Verbenac. etc. (1980) 259, 267, 284, 295, 306, 313, 320, 325, 334, 384, 386, 391-393, 412, 461; Baines, Aust. Pl. Gen. (1981) 97; Jacobs & Pickard, Pl. N.S.W. (1981) 209; Graf, Exotica, Ser. 4, 2 (1982) 2115; Bhoj-Raj, Rev. Palaeobot. & Palynol. 39 (1983) 358; Mold. in Dassan & Fosb., Fl. Ceylon 4 (1983) 447; Beadle, Stud. Fl. N.E. N.S.W. part 5 (1984) 858, fig. 378A; Elliot & Jones, Encyc. Aust. Pl. 3 (1984) 49 & t. ; Williams, Native Pl. Qld 2 (1984) 84, coloured photo p. 85; Stanley in Stanley & Ross, Fl. S.E. Qld 2 (1986) 369; Dunlop, Checklist Vasc. Pl. N.T. (1987) 79.

Type: Habitat in India, Herb. Linnaeus 809/3 (LINN, n.v.). Microfiche in AD seen.

Volkameria inermis L., Sp. Pl. 2 (1753) 637, *basionym*; Burm.f., Fl. Ind. (1768) 136; R. Br. in Ait. Hort. Kew. edn 1, 2 (1789) 364; Lour., Fl. Cochinch. (1790) 388; Willd., Sp. Pl. 3 (1800) 383; Pers., Synop. Pl. 2 (1807) 144; Blanco, Fl. Filip. edn 1 (1837) 511.

Type: As for *C. inerme* (L.) Gaertner.

V. commersonii Poir. in Lam., Encyc. 8 (1808) 688.

Type: From Philippines (FI herb Desfontaines, n.v.).

V. nereifolia Roxb., Fl. Ind. edn 2, 3 (1832) 64.

Type: "Island of Mascall, on the coast of Chittagong", India, now Bangladesh (K, n.v.).

Jasminum litoreum Rumph., Herb. Amb. 5 (1747) 86, t. 46, *nom. inval.*

Type: Herb. Amb. 5 (1747) 86, t. 46. Most of Rumphius' books, manuscripts and collections were destroyed by fire on 11 Jan. 1687. See Stafleu & Cowan, Taxonomic Literature 1983.

Clerodendron ovatum Poir., Encyc. Suppl. 4 (1816) 352, non R. Br. 1810.

Type: From Pondicherry, India (FI herb Desfontaines, n.v.).

C. buxifolium Sprengel, Syst. Veg. 2 (1825) 758.

Type: From "Patria" (HBG, n.v.).

C. coromandelianum Sprengel, Syst. Veg. 2 (1825) 758; Walp., Reper. Bot. Syst. 4 (1845) 112.

Type: From Pondicherry, Coromandel coast, India (HBG, n.v.).

C. commersonii (Poir.) Sprengel, Syst. Veg. 2 (1825) 758; Schauer in A. DC., Prodr. 11 (1847) 673; Miq., Fl. Ind. Bat. 2 (1858) 882; Merr., Philip. J. Sc. (Bot.) 7 (1912) 245; Fl. Manila (1912) 403; Philip. J. Sc. Bot. 9 (1914) 135; Interp. Rumph. Herb. Amb. (1917) 455; Sp. Blancoanae (1918) 334; Chung, Mem. Sc. Soc. China 1 (1924) 227; Domin, Biblioth. Bot. 89 (1928) 557.

Type: As for *Volkameria commersonii* Poir.

C. javanicum Sprengel, Syst. Veg. 2 (1825) 759; Walp., Reper. Bot. Syst. 4 (1845) 103; Miq., Fl. Ind. Bat. 2 (1858) 882.

Type: From Java, Indonesia (HBG, n.v.).

C. capsulare Blanco, Fl. Filip. edn 1 (1837) 509; edn 2 (1845) 355; edn 3, 2 (1878) 292; Schauer in A. DC., Prodr. 11 (1847) 674.

Type: From Philippines, n.v. whereabouts not known.

C. neriiifolium Wall. [cat. no. 1789 (1829)] ex Walp., Reper. Bot. Syst. 4 (1845) 110; Schauer in A. DC., Prodr. 11 (1847) 660; Miq., Fl. Ind. Bat. 2 (1858) 869; C.B. Clarke in Hook.f., Fl. Brit. Ind. 4 (1885) 589; King & Gamble, Mat. Fl. Malay. Penins. 4 (1909) 827; Fletcher, Kew Bull. (1938) 425; Prain, Bengal Pl. 2, reprint edn (1963) 623.

Type: From Tavoy, Tenasserim, Burma (K-W, n.v.).

C. inerme (L.) Gaertner var. *oceanicum* Gray, Proc. Amer. Acad. Arts & Sc. 6 (1862) 50.

Type: C. Wilkes s.n., South Pacific Explor. Exped. (GH, n.v.).

C. inerme (L.) Gaertner var. *neriiifolium* (Wall. ex Walp.) Kurz, Forest Fl. Burma 2 (1877) 266, based on *C. neriiifolium* Wall. ex Walp. 1845.

Type: As for *C. neriiifolium* Wall. ex Walp.

C. inerme (L.) Gaertner var. *ovalifolium* Kuntze, Rev. Gen. Pl. 2 (1891) 506.

Type: From Pondicherry, India (NY?, n.v.).

Description (Fig. 1)

A scandent shrub to 4 m high, sometimes prostrate or a large liana climbing to 13 m in trees. *Stem* 30-78 mm diam., hollow; bark pale-brown or whitish-grey, shallowly fissured; branches and branchlets slender, obtusely tetragonal, very minutely puberulous or glabrous. *Leaves* ovate or elliptic, entire, obtuse or shortly and obtusely acuminate, cuneate towards base, (3-) 4-10 (-12) cm long, (1-) 2-5 (-6) cm wide, thickly chartaceous or coriaceous, glabrous when fully grown, punctate beneath; petioles slender, puberulous, (3-) 5-15 (-23) mm long. *Inflorescence* more or less umbelliform thyrse, pubescent; cymes subterminal or in uppermost leaf-axils, usually 3-flowered, but sometimes 7- or more-flowered; peduncles slender, puberulous, (10-) 15-40 (-50) mm long. *Flowers* pedicellate, lax; pedicels puberulous, (2-) 3-6 (-9) mm long. *Calyx* campanulate, slightly dilated on margin, truncate and minutely toothed, glandular, glabrous or puberulous and with a few large nectariferous glands outside, glabrous inside, accrescent, 3-6 mm long, (2-) 3-5 mm diam. at top; teeth minute. *Corolla* white or sometimes touched with purple, hypocrateriform, 5-lobed, glabrous and glandular outside, villous inside tube; tube slender, cylindrical, (15-) 20-35 (-40) mm long, 2-3 mm diam. at throat; lobes elliptic-obovate to elliptic-oblong, (3.5-) 5-8 (-11) mm long, (1.5-) 2.5-4 (-5) mm wide. *Stamens* exerted; filaments inserted above middle of corolla-tube, pink or purple, filiform, mostly glabrous, villous near base, (15-) 20-35 (-38) mm long; anthers "yellow",

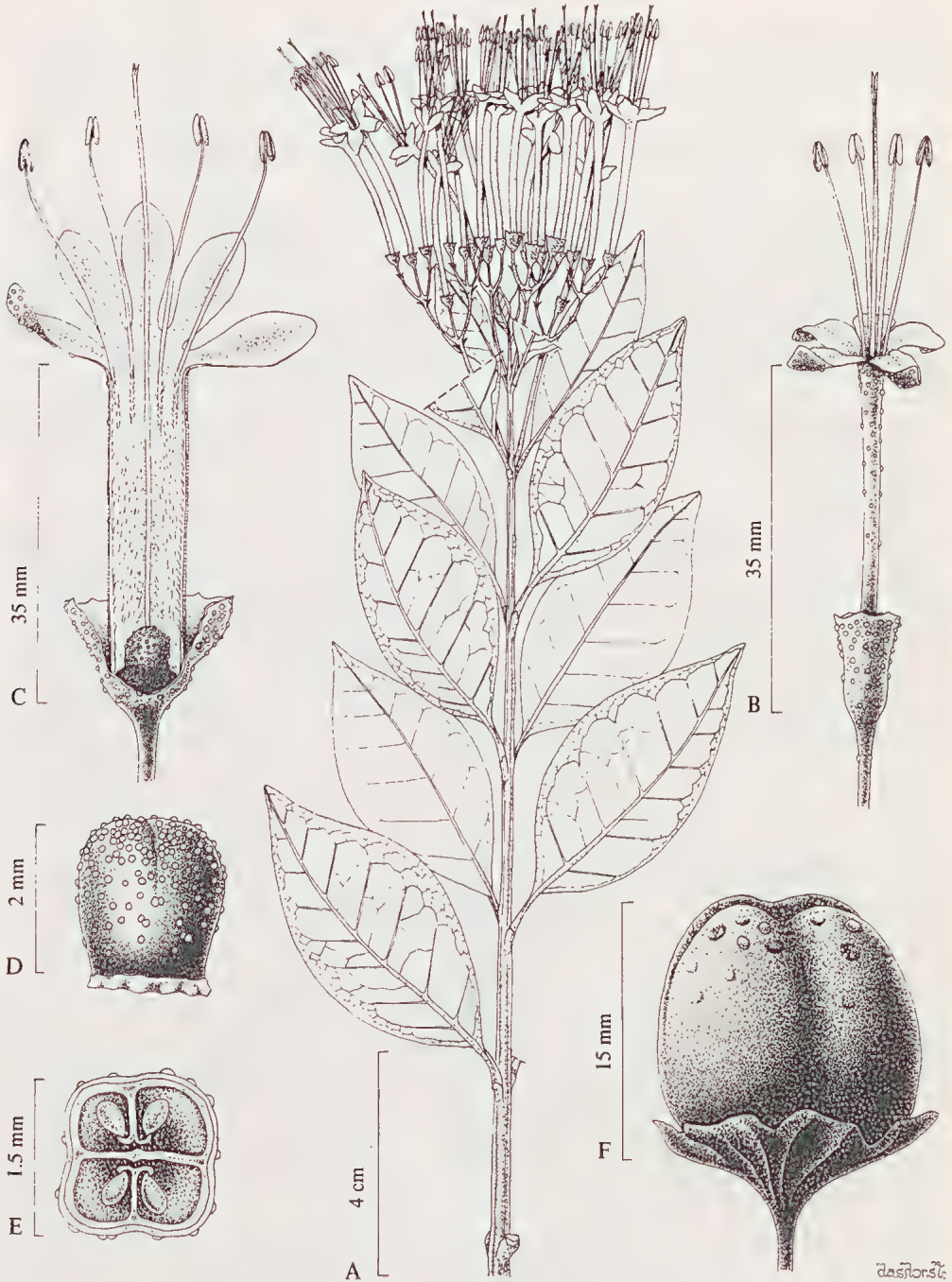


Fig. 1. *Clerodendrum inerme* (L.) Gaertner (A-F, B. Gray 175: BRI). A, habit sketch of a flowering branch; B, flower showing glands outside calyx and corolla; C, flower with calyx and corolla longitudinally cut open showing androecium and gynoecium, and hairs inside the corolla-tube; D, glandular ovary; E, transverse section of ovary; F, fruit with persistent calyx.

oblong, 2.5-3 mm long, \pm 1 mm wide. *Ovary* obovoid-subglobose, glabrous, glandular, somewhat 4-lobed, 1.5-2 mm long, 1-1.5 mm diam; style purple, exerted, filiform, glabrous, 25-48 mm long; stigma bifid. *Fruit* green, later turning brownish-black, obovoid to subglobose, distinctly 4-lobed, 10-15 (-20) mm long, 7-13 (-15) mm diam.; fruiting calyx 7-12 mm diam.

Representative specimens (collections seen: Australian 160, non-Australian 80)

AUSTRALIA: NORTHERN TERRITORY: *Burrell W/L1485*, Kapalga, South Alligator River, 30.x.1974 (DNA, NE); *Byrnes 880*, Thrings Creek, near mouth, 18.vii.1968 (AD, DNA, NT); *Craven 3661*, Samphire-saline grassland near mouth of the McArthur River, 6.ii.1976 (BRI, CANB, L, NT); *Craven 4395*, Black soil plain, Daly River, 24.vi.1977 (CANB, L, NT); *Cunningham 290*, Banks of S. Alligator River, 1819 (BM, MEL); *Dunlop 2683*, Rose River, Gulf of Carpentaria, 7.vii.1972 (AD, CANB, NSW, NT); *Dunlop 2944*, Maria Island, Gulf of Carpentaria, 26.vii.1972 (AD, CANB, NSW, NT); *Holtze 91*, Port Darwin, 1891 (G, Z); *Latz 3255*, Wessell Islands, 29.ix.1972 (BRI, CANB, NT); *Latz 6242*, Elcho Island, 16.vii.1975 (CANB, DNA, L, NT); *McKean B175*, East Arm, Darwin, 12.xii.1971 (CANB, DNA, K, NT); *Must 1343*, Berry Springs, 13.xii.1974 (BRI, DNA, NE, NT); *Perry 1787*, On bank McArthur River, c. 21 km NNE Borroloola, 27.vii.1948 (BRI, CANB, NT); *Rankin 1226*, East Point, 25.iv.1978 (DNA, NT); *Rankin 1946*, Woolner Stn, Adelaide River, 18.vi.1980 (CANB, DNA); *Robinson R827*, Adelaide River subcoastal plains Marrabai, 26.viii.1964 (DNA); *Specht 945*, Gove Peninsula, 22.viii.1948 (AD, BRI, CANB, L, MEL, PERTH); *Specht 1193*, Oenpelli, Arnhem Land, along the bank of tidal East Alligator River, 14.x.1948 (AD, BRI, CANB, L, MEL).

QUEENSLAND: *Bailey s.n.*, Port Curtis, Rockhampton, undated (BRI); *Bancroft 29*, Palm Island, undated (BRI); *Banfield 2805*, Brammo Bay, Dunk Island, 16.v.1917 (NSW 145076); *Banks & Solander s.n.*, Bay of Inlet, 1770 (BM 2 spec.); *Barker 5580*, Port Douglas, 21.vii.1988 (AD); *Betche s.n.*, Cairns, -viii.1901 (NSW); *Birch 66/45*, Townsville, -.xi.1965 (JCT 2 spec.); *Blake 15116*, Normanton, 13.viii.1945 (BRI, MEL); *Brass 189*, Massacre Inlet, 2.viii.1922 (BRI, CANB); *Brass 2347*, Daintree River, 19.iii.1932 (B, BRI, K); *R. Brown 2309*, Gulf of Carpentaria, Sweers Island, Bentinck Island, Allen Island, Pisonia Island, one of Bountiful Islands, 1802-3 (BM, LE); *Cameron 2175*, Horn Island, Torres Strait, 27.vii.1975 (QRS); *Cameron 2260*, Gabba Island, Torres Strait, 30.vii.1975 (QRS); *Cameron 2363*, Dauan Island, Torres Strait, 31.vii.1975 (QRS); *Cameron 2468*, Kubin Village, Banks (Moa) Island, 4.viii.1975 (QRS); *Cameron 2572*, Badu Island, Torres Strait, 17.xii.1976 (QRS); *Chalmers s.n.*, Murray Island, 1878 (MEL 98278); *Chalmers s.n.*, Thursday & Jervis Islands, 1878 (MEL 98373); *Clarkson 2027*, Escape River, 3.vi.1979 (BRI); *Clarkson 2307*, Howick Island, 12.vi.1978 (BRI); *Clarkson 3882*, Saibai Island, 21.x.1981 (AD, BRI); *Clarkson 5219*, 2.5 km N of the mouth of the McIvor River, 3.ii.1984 (AD, BRI, DNA, K, NSW, PERTH, QRS); *Dallachy s.n.*, Rockingham Bay, 11.iii.1863 (MEL 98485); *Domin 8138*, 8139, Russel River, -.i.1910 (PR); *Done s.n.*, Low Island, Great Barrier Reef, 22.vi.1969 (BRI); *Done s.n.*, Cairncross Islet East, Great Barrier Reef, 12.vii.1969 (BRI); *Elso 557 & Stanley s.n.*, Howick Island, 5.v.1979 (BRI); *Everist 9663*, Hinchinbrook Island S of Kirkville Hills, 14.viii.1970 (BRI); *Fagg 731*, Forrest Beach, c. 20 km E of Ingham, 25.v.1970 (AD, BRI, CBG); *Fitzalan s.n.*, Port Denison, 1874 (MEL 98258, MEL 98281); *Fosberg 54994*, Lizard Island, 26.vi.1973 (BRI, K, L); *Griffith s.n.*, Pioneer River, undated (MEL 98254); *Heatwole s.n.*, Bay Rock, about 19 km N Townsville near Magnetic Island, 4.iii.1971 (BRI 2 spec.); *Henne s.n.*, Sir Charles Hardy Island, undated (MEL 98271, MEL 98272, MEL 98283); *Hyland 6205*, Claudie River, 2.vii.1972 (BRI, L, QRS); *Johnson s.n.*, Russell River, 1892 (AD, MEL 98479, MEL 98443, MEL 583092, MEL 583093, MEL 583094); *Johnson s.n.*, Johnstone River, 1889 (MEL 98402, MEL 98403); *Johnson s.n.*, Endeavour River, -.vi.1891 (MEL 98502); *Johnson s.n.*, Stuart River, 1891 (MEL 583117, MEL 583118); *McDonald & Batianoff 1454*, 1 km N Cardwell, 10.iv.1975 (BRI); *McGillivray 396*, Yarraman, 1.ix.1957 (NSW); *Michael 1017*, Cannon Valley Beach, undated (BRI); *Moriarty 1460*, Bramston Beach E Babinda, 29.viii.1973 (BRI, CANB); *F. Mueller 44*, Port Denison, 14.xii.1862 (MEL 98259); *F. Mueller s.n.*, Gregory Exped., Moreton Bay, 1855 (MEL 98264); *F. Mueller s.n.*, Burdekin River, undated (MEL 98260, MEL 98261); *Ollerenshaw 1379*, *Krazing & Telford*, Burketown, c. 8 km NE Triginnii landing, 13.vii.1974 (BRI, CBG, NT); *Pajmans 2883*, Bank of tidal Marrett River, 40 km N of Kalpower Homestead, 13.viii.1978 (CANB); *Pajmans 3506*, Barratta Creek, lower Burdekin valley, 6.vi.1980 (CANB); *Persieh 283*, Endeavour River, 1882 (MEL); *Persietz 23*, Cooktown, 1877 (MEL 98474); *Sayer 158*, Mosman River, 1886 (MEL 98408); *Scarth-Johnson 319A*, Quarantine Bay, Cooktown, -.viii.1976 (BRI); *Simmonds 380*, Brisbane, 9.xi.1889 (BRI); *Smith 4920*, Clump Point, 4.xi.1951 (BRI, L); *Smith 12514*, Cape York, c. 8 km S of Cape York tip, 27.x.1965 (BRI, L); *Specht & Salt W133*, 12.5 km N of Wiepa Mission, 9.xii.1974 (BRI); *Stocker 1197*, Thursday Island, 12.vii.1975 (BRI, L, QRS); *Stoddart 4237*, Green Island, 18.viii.1973 (BRI, K, L); *Stoddart 4441*, East Hope Island, 4.ix.1973 (BRI, L, MO); *Stoddart 5077*, Saunders Island, 6.xi.1973 (BRI, L); *Telford 1688*, Malambin Beach, Yeppoon-Emu Park, 16.v.1970 (CBG); *Tindale & Aitken s.n.*, Bentinck Island, Gulf of Carpentaria, 1963 (AD); *Trapnell 181*, Walker Creek, 28 km N Normanton, 11.vii.1960 (BRI); *Tryon s.n.*, South Percy Island, 5.iii.1906 (BRI 265854, BRI 265856, BRI 265857); *Whaite 3642*, Smalley's Beach near Cape Hillsborough, 31.viii.1979 (BRI, NSW); *Webb & Tracy 5993*, Jacky Jacky Creek Bamaga, Cape York Peninsula, -.v.1962 (BRI, CANB); *White 10168*, Hayman Island, 9.vi.1934 (BRI); *White 12164*, Long Island, 20.vii.1935 (BRI, LE); *Woods 5 & 35*, 6th & 5th Isl., Northumberland Group. -.xi.1873 (MEL 98475, MEL 98477); *Wrigley & Telford 1428*, Quarantine Bay, S Cooktown, 19.vi.1972 (CBG).

NEW SOUTH WALES: *Bailey 310*, Ballina, -vi.1891 (NSW 145073); *Floyd 934*, Deadmans Creek, Ballina, 16.v.1978 (NSW); *Guilfoyle s.n.*, Tweed Heads, undated (MEL 98277); *Henderson s.n.*, Richmond River, undated (MEL 98297); *Williams 75011*, Tweed River, opposite Stott's Island, 19.ii.1975 (BRI); *Williams s.n.*, North Thumblegum, Tweed River, -v.1964 (NSW 145071).

PAPUA NEW GUINEA: *Brass 8017*, Lower Fly River, east bank, opposite Sturt Island, -x.1936 (A, BRI, CANB, LAE); *Hartley 9741A*, Along the coast at Malahang, c. 5 km NE of Lae, 16.i.1962 (BRI, C, CANB, LAE); *Pullen 8161*, Cape Rodney, Central District, East Papua, 29.viii.1969 (A, CANB, K, L, LAE).

Distribution and ecology (Map 2)

In Australia, *C. inerme* is chiefly distributed in the coastal areas of Northern Territory, Queensland and far north-eastern tip of New South Wales. In Northern Territory, most localities are from Daly River northwards to western part of Arnhem Land. Along the coast of the Gulf of Carpentaria, it has been collected from Gove Peninsula and along the coastal parts of Limmen Bight. A few collections are also known from Maria Island and Sir Edward Pellow Group of Islands.

Distribution in Queensland is mainly along the east coast. It has been most commonly recorded from the areas along the Gold Coast, Brisbane and from Rockhampton northwards to the tip of Cape York Peninsula. On the Gulf-side it has been recorded from coastal areas near Wiepa, Normanton, Burktown and Massacre Inlet. A few collections are also known from South Wellesley Islands in the Gulf of Carpentaria. Besides, this species has been recorded from several off-shore islands in the Torres Strait and along the Great Barrier Reef.

In New South Wales, this species is known to occur in the area called MacPherson Macleay Overlap. Here, it has been collected from Richman River and Ballina northwards to Coolangatta and Tweed Heads near the Queensland border.

Collections from outside Australia have been examined from most parts of Malesia, Melanesia and Polynesia. In addition to this, Moldenke (1983) recorded it from India, Sri Lanka, Bangladesh, Burma, Thailand, Indo-China, southern China, Taiwan and almost throughout Oceania.



Map 2. Distribution of *C. inerme* ○.

Found usually along "tidal river banks" and on "coastal sand dunes".

Comments

The authorship of *C. inerme* has been erroneously attributed by Bentham (1870) and a few others to Robert Brown (1810). As shown here in the literature cited, this species is based on *Volkameria inermis* L. which was first combined with *Clerodendrum* by J. Gaertner, resulting in a new combination *C. inerme* (L.) Gaertner.

This species is characterized by its truncate calyx and usually 3-flowered cymes. According to H.J. Lam (1919); this "species is a rather polymorphous one, being variable in form of leaves, form and tomentum of calyx, and in the cymes".

The corolla and stamens have been recorded by several botanists and collectors as "white". According to present investigation, however, the corolla is found to be white but touched with purple, and stamens and style almost always purple-pink when fresh.

Presence of glands on the outside of the corolla and on the ovary, and hairs inside the corolla-tube have not been mentioned in any previously published description of this species. In a fully mature flower, the glands on the outside of the corolla often tend to become thin and sparse.

Elliot & Jones (1984) recorded *C. inerme* from Western Australia, but the occurrence of this species in that state has not been confirmed by any collection. It is reportedly very common near the sea and along coasts from India to the coasts of Australia and almost throughout Oceania. Therefore, this species could be expected along Western Australia's coastal areas of Kimberley region.

According to some botanists, *C. inerme* can be carefully trained and sheared by the art of topiary.

Affinities

C. inerme is apparently close to *C. heterophyllum* in its leaves being glabrous; calyx glabrous, glandular outside, truncate or shallowly toothed; corolla-tube glabrous and glandular on the outside, villous inside; stamens and style purple. Nevertheless, *C. inerme* may easily be identified by its large leaf-blades being elliptic-ovate, non-punctate, 30-120 by 10-60 mm; corolla-tube much larger, 15-40 mm long; ovary glandular and plant habit scandent. The leaf-blades in *C. heterophyllum* are narrowly elliptic or lanceolate-elliptic, 5-35 mm wide; corolla tube short, 10-15 mm long.

C. inerme is also nearer to *C. parvulum* in their corolla-tubes being villous inside and stamens and style purple. The latter, however, differs in its leaves being much smaller, 5-30 by 1.5-7 mm, narrower and sessile; calyx distinctly 5-lobed, pubescent on the outside and ovary non-glandular. Moreover, *C. parvulum* is a small erect shrub 24-100 cm high only, while *C. inerme* is a scandent shrub to 4 m high or a large liana climbing to 13 m in trees.

2. ***Clerodendrum heterophyllum*** (Poir.) R. Br. in Ait., Hort. Kew. 2nd edn, 4 (1812) 64; Sprengel, Syst. Veg. 2 (1825) 758; Schauer in A. DC., Prodr. 11 (1847) 660; Baker, Fl. Mauritius & Seychells (1877) 254; Mold., Résumé Verbenac. etc. (1959) 155, 157, 158, 161, 208, 216, 273, 391, 392; in Humbert, Fl. Madag. 174 (1966) 237; Fifth Summary Verbenac. etc. 1 & 2 (1971) 260, 264, 265, 272, 345, 358, 463, 732, 733, 971; Phytologia 31 (1975) 391; Phytologia 36 (1977) 38; Sixth Summary Verbenac. etc. (1980) 249, 252, 254, 259, 334, 349, 461; Mani. & Siv., Fl. Calicut (1982) 233; J. Econ. Tax. Bot. 3 (1982) 814; Mold. in Dassan & Fosb., Fl. Ceylon 4 (1983) 430; Phytologia 60 (1986) 182-188, 362, 465.

Type: Herb. *Desfontaines s.n.*, from Mauritius (FI or P, n.v.).

Volkameria heterophylla Poir. in Lam., Encycl. 8 (1808) 687, **basionym**.

Type: As for *C. heterophyllum* (Poir.) R. Br.

Description (Fig. 2)

A low much-branched shrub, 1-3 m high. *Branches* twiggy, subterete or obscurely tetragonal, cinereous-puberulous, glabrescent when old; nodes often distinctly marked with leaf-bases; principal internodes greatly abbreviated. *Leaves* decussate-opposite or more often ternate, approximate and crowded; leaf-blades narrowly elliptic or lanceolate-elliptic, entire, short-acuminate, (15-) 25-75 (-90) mm long, (5-) 10-25 (-35) mm wide, membranous, bright green on both surfaces or slightly lighter beneath, glabrous or somewhat puberulous on main nerves beneath, densely punctate on both surfaces; petioles slender, minutely puberulous, 3-10 (-15) mm long. *Inflorescence* axillary, lax, usually corymbiform, densely greyish-puberulous; cymes once or twice dichotomously branched, 30-50 mm long, 40-60 mm wide; primary lateral peduncles 10-35 mm long. *Flowers* pedicellate; pedicels slender, densely cinereous-puberulous, 3-12 (-15) mm long, the central flowers often with longer pedicels. *Calyx* campanulate, its rim truncate, entire to subentire or distinctly 5-toothed, glandular and sparsely puberulous on the outside, glabrous inside; teeth minute, ovate, acuminate, triangular, 1-1.5 mm long; tube cylindrical, 3-4 mm long, 1.5-2 mm wide. *Corolla* white, glandular and very minutely pulveraceous-puberulous or almost glabrous outside, villous inside tube; lobes subequal, oblong or obovate-oblong, obtuse, glabrous and non-glandular on inner surface, 3.5-6 (-7) mm long, 2-3 (-3.5) mm wide; tube slender, cylindrical, 10-13 (-15) mm long, 1-1.5 mm diameter. *Stamens* purple, exserted; filaments inserted above middle of corolla-tube, glabrous, filiform, 15-22 mm long; anthers oblong, 1-2 mm long. *Ovary* glabrous, obovoid-globose, faintly 4-lobed, 1-1.5 mm diameter; style purple, much exserted, surpassing the stamens, filiform, glabrous, (15-) 20-35 mm long, with stigma minutely 2-lobed. *Fruit* subglobose, glabrous, somewhat sulcate between seeds, about 7 mm diam., turning black in drying.

Distribution (Map 3)

This species is native to the Mascarene Islands, but is cultivated in many places namely Russia, Europe, India, Sri Lanka, Maryland U.S.A., Australia and South Africa. In India, Madagascar and Australia, it has been found growing wild as a naturalised garden escape.

Comments

C. heterophyllum seems to be a variable and somewhat polymorphic species. Baker (1877) recorded the leaves as being "2-4 inches", but leaves that long have not been observed in the Australian collections.

No mature fruit was available for examination. The fruit-size recorded here has been taken from the species description by Moldenke (1983).

The presence of villous tomentum on the inside of corolla-tube has not been recorded by any previous botanist.

In Mauritius and Reunion, *C. heterophyllum* is reportedly "employed medicinally as an antisyphilitic. It contains some ethereal oil, but no alkaloides nor glycosides".

According to Moldenke (1986), "material of *C. heterophyllum* has been misidentified and distributed in some herbaria as *C. aculeatum* (L.) Schlecht., *C. inerme* (L.) Gaertner, *C. inerme* R. Br. (sen. lat.), *C. laciniatum* Balf.f., *C. ligustrinum* (Jacq.) R. Br., *C. splendens* G. Don, *C. tomentosum* (Vent.) R. Br., *Manabea* sp., *Volkameria ligustrina* Jacq., *V. angustifolia* Lam., *V. angustifolia* Poir. and *Volkameria* sp."

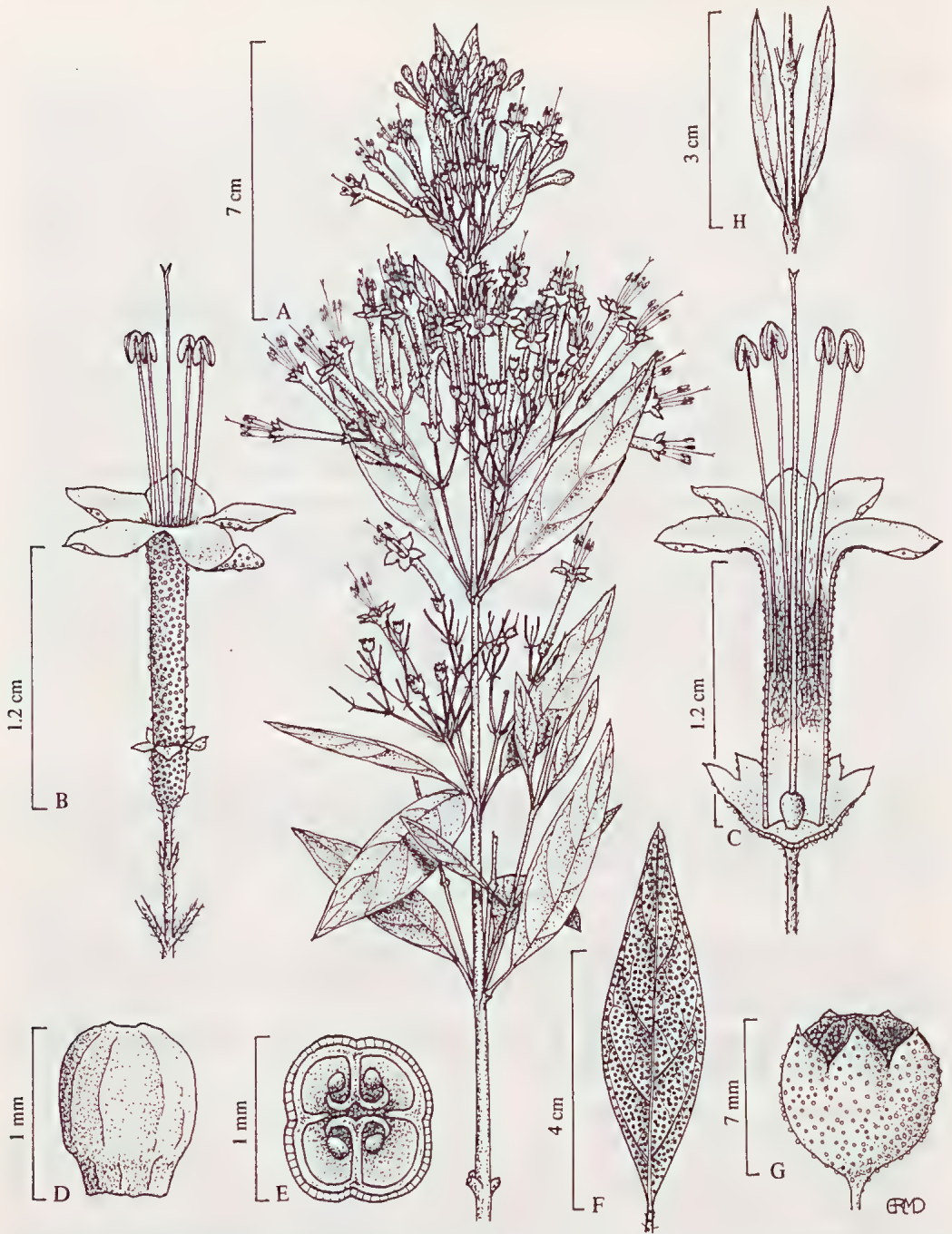


Fig. 2. *Clerodendrum heterophyllum* (Poir.) R.Br. var. *baueri* Mold. f. *baueri* (A-G, C.T. White 12647: BRI). A, habit sketch of a flowering branch; B, flower showing glands outside calyx and corolla; C, flower with calyx and corolla vertically cut open showing androecium, gynoecium and villosity inside the corolla-tube; D, ovary; E, transverse section of ovary; F, leaf-blade showing glands on adaxial surface; G, fruit with persistent calyx. *Clerodendrum heterophyllum* (Poir.) R. Br. f. *angustifolium* Mold. (H, C.T. White 12401: BRI). H, showing narrow linear leaf-blades.

In northern Queensland, it is grown in "Greenleaves Nursery" at Mt Gravatt and at Julia Creek near Cairns. "Widely planted as a hedge" in some areas.

Affinities

According to Moldenke (1986), *C. heterophyllum* "is very closely related to *C. angustifolium* (Poir.) Spreng., *C. ligustrinum* (Jacq.) R. Br. and *C. aculeatum* (L.) Schlecht. and probably also to *C. emirnense* Bojer ex Hook.". Among the Australian species of the genus *Clerodendrum*, *C. heterophyllum* seems nearest to *C. inerme*. In both species, the leaf-blades and calyces are glabrous, and calyx-tube truncate or shallowly toothed. For distinguishing characters see "affinities" under *C. inerme*.

2a. *C. heterophyllum* (Poir.) R. Br. var. *heterophyllum*. Mold., Phytologia 4 (1952) 127.

C. heterophyllum (Poir.) R. Br. in Ait., Hort. Kew. 2nd edn, 4 (1812) 64.

Type: As for *Volkameria heterophylla* Poir.

The typical variety of this species has leaf-blades "10-35 mm" wide at the mid-point and the rim of calyces truncate and entire or subentire (Moldenke, 1983), and does not seem to exist in Australia because all available collections of this species are found to have their calyx-rim distinctly but shortly toothed.

2b. *C. heterophyllum* (Poir.) R. Br. var. *baueri* Mold., Phytologia 4 (1952) 127; Biol. Abstr. 27 (1953) 984; Résumé Verbenac. etc. (1959) 208; Fifth Summary Verbenac. etc. 1 (1971) 345; Sixth Summary Verbenac. etc. (1980) 334; in Dassan. & Fosb., Fl. Ceylon 4 (1983) 432; Phytologia 60 (1986) 188 f. *baueri* (Mold.) Munir, comb. nov.

Type for variety and forma: "The taxon is based on a series of drawings made from living material at Keppel Bay, Queensland, Australia, by Ferdinand Lucas Bauer between 1801 and 1803 and deposited in the herbarium of the Naturhistorisches Museum at Vienna, drawing 968a being regarded as the type" (W, holotype, n.v.; LL, NY — photos of isotype drawings, n.v.).

Volkameria angustifolia Ander., Bot. Repos. 9 (1809) t. 554.

Type: Based on a specimen communicated by Mr. Donn, Curator of the Cambridge Botanic Garden. Plant is a native of the Isle of France (=Mauritius) grown in the Cambridge Botanic Garden. No herbarium specimens are known to exist.

Diagnosis (Fig. 2)

This taxon differs from the typical variety of the species in having its calyx-rim distinctly toothed, the teeth short and triangular. The forma *baueri* differs from forma *angustifolium* by its broader leaves.

Specimens examined

AUSTRALIA: QUEENSLAND: *Boorman s.n.*, Brisbane, -iv.1899 (NSW); *Brazil s.n.*, Julia Creek, -xii.1935 (BRI 266618); *Flecker 591*, Cairns, 29.vi.1935 (QRS); *Jarvis 29*, Meringa near Cairns, undated (BRI 265799); *Maiden s.n.*, Maryborough, -iii.1909 (NSW 145084); *McKenzie 371*, Woorim, Bribie Island, 4.ii.1977 (BRI); *Rowan s.n.*, northern Queensland, loc. incert., 1891 (MEL 560539); *Scarth-Johnson 383A*, Cooktown, near Grassy Hill, 18.iii.1977 (BRI); *Schuurman 192*, Brisbane, 18.vii.1969 (L.); *Kleinschmidt 276*, Mt Gravatt, 14.iv.1970 (BRI); *Webb 390*, Gladstone Road, 22.xii.1944 (CANB); *White 1588*, Cairns, 16.iii.1922 (BRI 265798).

Distribution and ecology (Map 3)

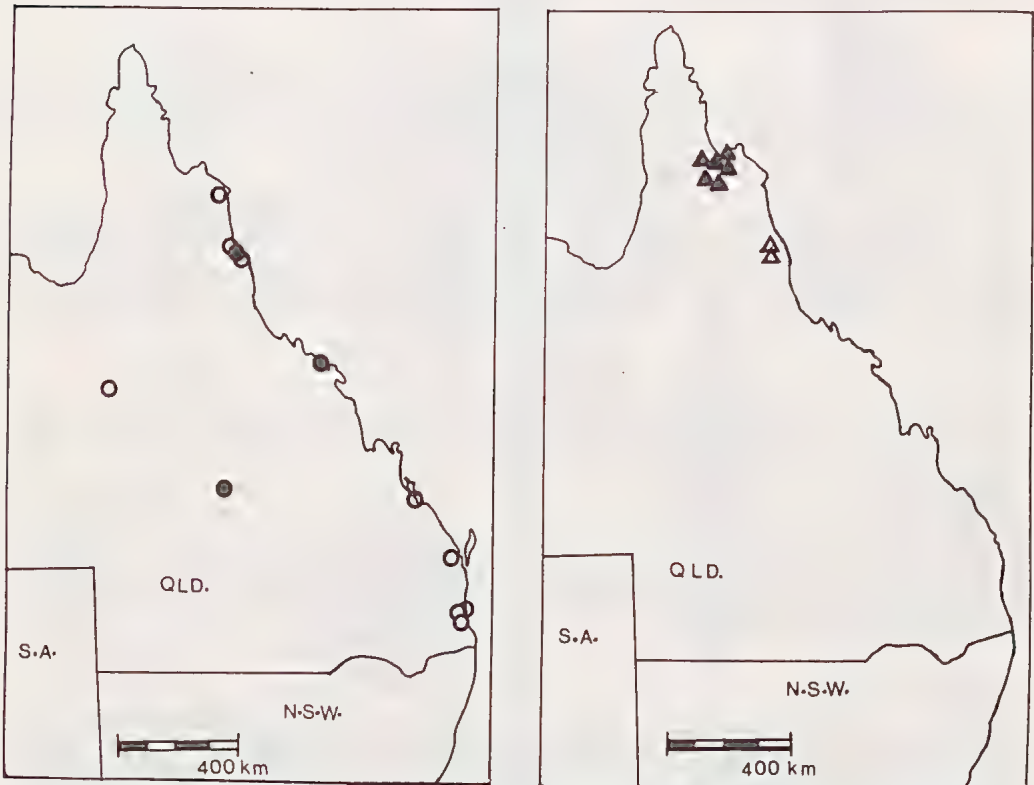
Forma *baueri* seems endemic to Queensland in Australia. In Queensland, the main distribution is along the east coast between Cooktown and Brisbane. The only known inland locality is near Julia Creek township. Being a naturalised garden escape, almost all known localities are close to cities and towns. According to some collectors' field notes, this taxon occurs mostly on beach-fronts or along sandy sea-shores.

Comments

In Australia, *f. baueri* is often widely planted as a hedge in northern Queensland. It is also planted as an ornamental shrub in gardens, particularly in seaside localities.

According to collectors' field notes the flowers of this taxon are unscented or only very slightly.

Moldenke (1986) placed *Volkameria angustifolia* Andr. in the synonymy of *C. heterophyllum* f. *angustifolium* Mold. During present investigations, the leaf-blades in the type (coloured plate only) of *V. angustifolia* Andr. are found to be more than 10 mm wide at the mid-point and the calyx-rim distinctly toothed. In view of the wider leaf-blades and toothed calyx-rim *V. angustifolia* Andr. seems nearest to var. *baueri* f. *baueri*. Similarly, the Indian records of this species reported by Sivarajan & Manilal (1982) may also belong to this variety.



Map 3. Distribution of *C. heterophyllum* var. *baueri* f. *baueri* ○, *C. heterophyllum* var. *baueri* f. *angustifolium* ●, *C. parvulum* ▲, *C. grayi* △.

According to the protologue of var. *baueri*, "one of the types (drawing) was submitted to the Royal Botanic Gardens, Kew, where late Dr. R. Melville studied it. His report was that it did not match any material in the Kew herbarium nor any known Australian species. He thought that the plant may have been a hybrid between "*C. hemiderma*" [= *Glossocarya hemiderma*] and *C. floribundum*". Moldenke (1952), however, did not agree with Dr. Melville's view and observed that this taxon represents a variety of the very variable *C. heterophyllum* with which its broad-leaved typical form agrees almost perfectly in all characters except the plainly short-toothed calyx-rim.

Affinity

Forma *baueri* is nearest to the typical form in all major characters, particularly in the shape, size and width of its leaf-blades. However, it may easily be distinguished by its calyx-rim being distinctly toothed.

2c. *C. heterophyllum* (Poir.) R. Br. var. *baueri* Mold. f. *angustifolium* Mold., Phytologia 3 (1950) 315.

C. heterophyllum (Poir.) R. Br. f. *angustifolium* Mold., Phytologia 3 (1950) 315, in Humbert, Fl. Madag. 174 (1956) 155, 237, 267; Résumé Verbenac. etc. (1959) 157, 158; Fifth Summary Verbenac. etc. 1 (1971) 264, 265; Phytologia 36 (1977) 39; Sixth Summary Verbenac. etc. (1980) 252, 254, 259, 340, 349; in Dassan. & Fosb., Fl. Ceylon 4 (1983) 431; Phytologia 58 (1985) 189; Phytologia 60 (1986) 186, 187, 465.

Type: *George Gardner s.n.*, Port Louis, Mauritius, (K, holotype; LL, NY — photos of type; NY, isotype).

Diagnosis (Fig. 2H)

This form differs from the typical variety and f. *baueri* in having its leaf-blade linear, less than 10 mm wide at the mid-point.

Specimens examined

AUSTRALIA: QUEENSLAND: *Flecker s.n.*, Cairns, 3.xii.1933 (QRS); *Rogers s.n.*, Queen's Beach, Bowen, 1.vii.1957 (BRI 004956); *White 12401*, Barcaldine, 21.xi.1943 (BRI).

Distribution and ecology (Map 3)

In Australia, f. *angustifolium* has been recorded only from three different localities, of which two are along the east coast near Cairns and Bowen townships, and the third at least 50 km inland to the west of Rockhampton near Barcaldine.

Distribution outside Australia has been recorded by Moldenke (1971, 1980, 1986) from Mauritius and Réunion on the Mascarene Islands, and as naturalised in Kerala in southern India.

Growing usually in sandy soil in beach front.

Comments

The form *angustifolium* is apparently native to Mauritius and Réunion, but has been introduced and become naturalised in parts of southern India and north-eastern Australia. According to collector's notes, this taxon is a common hedge plant in Queensland. It is not recorded in collections from Queensland, whether they are from naturalised plants or from abandoned cultivated areas.

The precise flowering period remains uncertain. One collector "found the plant in anthesis in April", while the other collector has noted: "in flower in October".

According to Moldenke (1986), material of f. *angustifolium* "has been misidentified and distributed in some herbaria as typical *C. heterophyllum* (Poir.) Spreng., *C. commersonii* Spreng., *C. neriifolium* Wall. and *Manabea* sp."

Affinities

According to Moldenke (1986), "this form as well as *C. heterophyllum* itself, is certainly closely related to *C. angustifolium* (Poir.) Spreng." The toothed calyx-rim places it nearer to var. *baueri* but the narrow linear leaves at once distinguish it.

3. *Clerodendrum longiflorum* Decne., Nouv. Ann. Mus. Hist. Nat. 3 (1834) 400 var. *glabrum* Munir, var. nov.

Siphonanthus floribundus Banks & Sol., Ill. Austral. pl. Cook's voy. (1901) 75, t. 239 syn. nov.; Mold., Résumé Verbenac. etc. (1959) 344, pro syn. *C. floribundum* R. Br.; Mold., Fifth Summary Verbenac. etc. 2 (1971) 622, pro syn. *C. floribundum* R. Br.; Mold., Sixth Summary Verbenac. etc. (1980) 437, pro syn. *C. floribundum* R. Br.

Type: *J. Banks & D. Solander s.n.*, Bay of Inlets, Palm Island, Endeavour River, Queensland, 1770 (BM, syntypes!).

Clerodendrum cunninghamii Benth., Fl. Aust. 5 (1870) 64, p.p. quoad syntypes *E. Daemel s.n.* & *J. Jardine s.n.*, Cape York, Qld; Bailey, Qld Fl. 4 (1901) 1184, p.p. quoad spec. *E. Daemel s.n.* & *J. Jardine s.n.*, Cape York, Qld.

C. floribundum auct. non R. Br.: Mold. in Dassan. & Fosb., Fl. Ceylon 4 (1983) 456, p.p. quoad syn. *Siphonanthus floribundus* Banks & Sol.

Var. *glabrum* a varietate typica ramulis, foliorum venis abaxialibus, pedunculis, pedicellis calycibusque semper glabris differt.

Type: *I.R.H. Telford 1997*, Paluma Range Road, S of Ingham, Queensland, 24.v.1970 (CBG, holotype; BRI, isotype).

Diagnosis

Var. *glabrum* differs from the typical variety by its branchlets, abaxial leaf-veins, peduncles, pedicels and calyces always being glabrous.

Description (Fig. 3)

A tall shrub or small tree, (1-) 2-9 (-20) m high. *Stem* light-brown with greenish-grey bark, 10-30 cm diam. at breast height. *Leaves* ovate, elliptic-ovate or oblong-elliptic, attenuate towards both ends, entire, (6-) 8-20 (-26) cm long, (3-) 5-10 (-15) cm wide, glabrous, chartaceous; petiole glabrous, (1-) 3-6 (-8) cm long. *Inflorescence* a corymb-like thyrse, 10-15 (-20) cm long, 10-15 (-25) cm wide, somewhat exceeding upper leaves; peduncle glabrous, primary lateral branches 1.5-5 (-7) cm long. *Flowers* pedicellate; pedicels glabrous, (3-) 5-15 (-30) mm long. *Calyx* campanulate, deeply lobed, 7-15 (-18) mm long, glabrous, glandular inside; lobes ovate-lanceolate or almost triangular, acuminate, 5-8 mm long, 2.5-5 (-6) mm wide at base; tube narrowed at base, 3-5 (-6) mm long. *Corolla* white, hypocrateriform, glabrous; tube slender, rather long, (5-) 6-8 (-10) cm long, 1.5-3 mm diam.; lobes elliptic, elliptic-oblong or oblong-spathulate, 5-10 (-13) mm long, 3-5 (-7) mm wide. *Stamens* much exerted; filaments inserted above middle of corolla-tube, white, glabrous, filiform, 35-50 mm long; anthers oblong, 2.5-3 mm long. *Ovary* glabrous, globose, 1.5-2.5 mm diam.; style much exerted, white, filiform, glabrous, 65-105 mm long. *Fruit* globose-obovoid, dark-purple or blue-black, glabrous, 6-10 mm long, 6-9 (-10) mm diam. at top end; fruiting calyx dark-purple or dark-red, enlarged, somewhat funnel-shaped, shortly contracted at base, lobes spreading or recurved, deltoid, 20-25 (-30) mm diam.



Fig. 3 *Clerodendrum longiflorum* Decne. var. *glabrum* Munir. (A-D, B. Hyland 5018: QRS; E, L.J. Brass 19259: CANB). A, habit sketch of a flowering branch; B, flower with calyx and corolla longitudinally cut open showing androecium and gynoecium; C, ovary; D, transverse section of ovary; E, fruit with persistent enlarged calyx.

Representative specimens (collections seen: Australian 83; non-Australian 8)

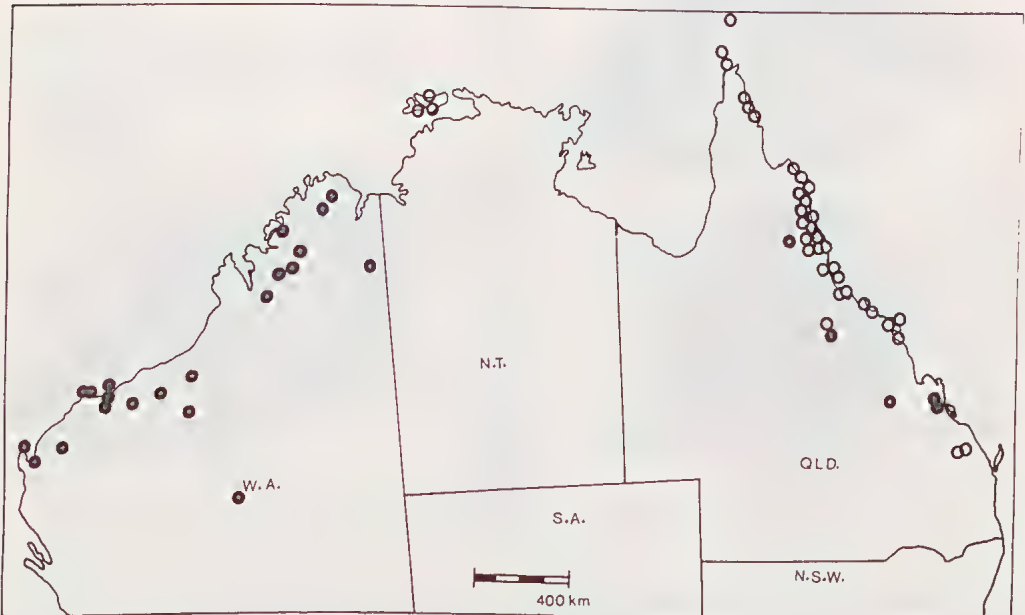
AUSTRALIA: QUEENSLAND: *Andrews 165*, beside Old Dalrymple Track near Cardwell, 10.v.1975 (BRI); *Banks & Solander s.n.*, Bay of Inlets, Palm Islands, Endeavour River, 1870 (BM, syntypes of *Siphonanthus floribundus* Banks & Sol.); *Barnard 7741*, Lake Barrine, Atherton, 15.vi.1941 (BRI); *Betche s.n.*, Cairns, -.viii.1901 (G); *Boylard (& Gillieatt) 501*, c. 30 km NNW Daintree, 20.xi.1967 (BRI, QRS); *Brass 19259*, Iran Range, Cape York Peninsula, 19.vi.1948 (A, CANB, K, L, LE); *Brass 33624*, Saddle Mountain near Kuranda, 3.viii.1967 (BRI, QRS); *Cameron 2463*, Moa Island, Torres Strait, 4.viii.1975 (QRS); *Cameron 20209*, Prince of Wales Island, Torres Strait, 13.ii.1975 (QRS); *Craven 3169*, c. 20 km from Bowen on Townsville Road, 7.iv.1975 (CANB); *Daemel s.n.*, Cape York, undated (MEL 98069, syntype of *C. cunninghamii* Benth.); *Dallachy s.n.*, Rockingham Bay, 3.vi.1863 (K, MEL 98078, MEL 98079, MEL 98080); *Gilmour s.n.*, Wyvuri Holding, 22.iii.1974 (BRI, L, QRS); Gittins 2168, Shipton's Flat, S Helenvale, 30.viii.1970 (BRI, NSW); *Goy 336*, Magnetic Island, 24.vii.1938 (BRI); *Guymmer 1135*, 23.6 km NNW Proserpine, 4.ix.1977 (BRI); *Hockings 18*, 8th Creek, Missionary Bay, Hinchinbrook Island, 24.viii.1979 (BRI); *Hyland 4079*, S.F.R. 299 Conway, 1.iii.1974 (BRI, L, QRS); *Hyland 7502*, Olive River, 14.ix.1974 (BRI, QRS); *Irvine 88*, Mt. Lewis Area, 25.xi.1971 (BRI, L, QRS); *Jacks s.n.*, Windsor Tablelands, 14.vi.1980 (AD); *Jardine s.n.*, Cape York, loc. incert., undated (MEL 98077, syntype of *C. cunninghamii* Benth.); *Ladbrook s.n.*, Johnstone River, -.viii.1917 (BRI); *Moriarty 1410*, Gap Creek, S of Cooktown, 18.viii.1973 (BRI); *Persieh 77*, Endeavour River, 1883 (MEL 98497, MEL 98509); *Sayer s.n.*, near Trinity Bay, 1886 (MEL 98459); *Schulz 194*, Cape Hillsborough, 26.viii.1976 (QRS); *Telford 1997*, Paluma Range Road, S Ingham, 24.v.1970 (CBG holotype, BRI isotype); *Webb & Tracy 11495*, Tinaroo Range Road, between Mareeba and Tinaroo Dam, 11.v.1972 (BRI, CANB); *Wrigley & Telford 583*, Millstream Falls, W Ravenshoe, Qld (CBG); *Wyatt 6*, Tolga, -.xii.1961 (BRI).

NORTHERN TERRITORY: *Cunningham 289*, Bathurst Island, 1818 (BM, K); *Dunlop 3454*, Melville Island, 18.iv.1973 (CANB, DNA, NT); *Webb & Tracy 12896*, Snake Bay, Melville Island, -.v.1978 (QRS).

PAPUA NEW GUINEA: *Brass 13474*, 2 km SW Bernhard Camp, Idenburg River, -.iii.1939 (A, BRI, LAE); *Henty & Katik NGF 38743*, Wassi Kussa River, Western District, Papua, 11.vii.1968 (A, BRI, CANB, K, L, LAE).

Distribution and ecology (Map 4)

In Australia, *C. longiflorum* var. *glabrum* is found in the tropics of Northern Territory and Queensland. In Northern Territory, this taxon has been recorded only from Bathurst Island and Melville Island. Distribution in Queensland is chiefly along the east coast from Bundaberg northwards to the tip of Cape York Peninsula. The major area of its occurrence, however, is



Map 4. Distribution of *C. longiflorum* var. *glabrum* ○, *C. tomentosum* var. *lanceolatum* ●.

between Mackay and Cooktown, and is most common in the coastal area east of the Atherton Tableland. In the northern part of the Cape York Peninsula, it has most frequently been recorded from the vicinity of the Iron Range and Scrubby Creek. It has also been recorded from several off-shore Islands along the east coast and in the Torres Strait. So far, it has not been reported from within or along the Gulf of Carpentaria, nor from inland area of the state.

Collections examined from Papua New Guinea were the only ones seen from outside Australia.

Growing usually on "sandy" or gravelly soil or among "granite boulders", and often recorded on margin of rainforest or vineforest. Also found in "open grassy forest" on "banks of creeks" and "in woodland on rocky hills".

Comments

C. longiflorum is recorded for Australia for the first time. Previously, all Australian collections of this species were identified as *C. cunninghamii* Benth. or *C. floribundum* R. Br.

The pedicels of terminal flowers are often much longer than those of lateral ones. For instance, in *A. Irvine 88* (QRS) the terminal pedicels are up to 30 mm long while the lateral ones are mostly 3-10 mm long.

In some overseas collections, the pedicels and calyces are somewhat puberulous when young, but become glabrous at fruiting stage.

Affinities

C. longiflorum var. *longiflorum* is easily distinguished from var. *glabrum* by its branchlets, peduncles, pedicels, calyces and petioles being pubescent, calyx and corolla glandular on the outside and leaf-veins puberulous on abaxial surface. *C. longiflorum* var. *glabrum* is similar to *C. costatum* R. Br. (= *C. cunninghamii* Benth.) in its inflorescence being a corymb-like thyrse, calyx glandular inside, corolla-tube always more than 45 mm long and leaves more or less of similar shape and size. Nevertheless, *C. longiflorum* var. *glabrum* can readily be identified by its leaves and inflorescence always being glabrous and corolla-tube up to 100 mm long. The corolla-tube in *C. costatum* is up to 70 mm long and the abaxial leaf-surface, petiole, pedicel, peduncle and outer surface of calyx are always pubescent.

4. *Clerodendrum floribundum* R. Br., Prodr. Fl. Nov. Holl. (1810) 511; Schauer in A. DC., Prodr. 11 (1847) 671; Benth., Fl. Aust. 5 (1870) 63; Bailey, Qld Fl. 4 (1901) 1183; H.J. Lam, Verbenac. Malay. Archip. (1919) 258; Domin, Biblioth. Bot. 89 (1928) 558; Mold., Résumé Verbenac. etc. (1959) 260, 266, 271, 273; Fifth Summary Verbenac. etc. 1 (1971) 345, 349, 439, 441, 442, 450, 452, 460, 461, 464, 576; Sixth Summary Verbenac. etc. (1980) 325, 334, 339; in Dassan & Fosb., Fl. Ceylon 4 (1983) 456, p.p. excl. syn. *Siphonanthus floribundus* Banks & Sol.; Stanley in Stanley & Ross, Fl. S.E. Qld 2 (1986) 370.

Lectotype: R. Brown s.n. (*J.J. Bennett no. 2314*), "Littora Novae Hollandiae intro tropica", "one of Harvey's Islands", 25.ix.1802 (BM, lectotype designated here!; BM, 2 spec., K, 2 spec. — isolectotypes!).

Typification

C. floribundum is based on Robert Brown's three different collections from "East Coast" of Queensland consisting of at least 7 duplicates. All duplicates were annotated by Robert Brown and certainly used by him in preparing the original diagnosis of this species. As no holotype was designated by the author a lectotype is selected here. Of all the syntypes, a duplicate of his [possibly "one of Harvey's Islands"] one collection in Herb. BM is particularly complete and well preserved and is chosen here as the lectotype of this species.



Fig. 4. *Clerodendrum floribundum* R. Br. var. *floribundum* (A-G, R. Brown s.n. J.J. Bennett no. 2314; BM, lectotype; H, R. Brown s.n. J.J. Bennett no. 2313; E). A, flowering branch; B, cyme; C, flower; D, flower with calyx and corolla vertically cut open to show androecium and gynoecium; E, enlarged calyx; F, ovary; G, transverse section of ovary; H, fruit with persistent calyx.

Description

A tall shrub or small tree, usually quite glabrous, or in some varieties young parts sparsely or densely pubescent. *Stem* smooth, cylindrical, speckled, greenish-yellow or greyish-brown, sometimes young parts dull purplish; bark light grey, often furrowed. *Leaves* petiolate; lamina variable, ovate, elliptic, lanceolate or varying from broadly ovate, cordate, narrowly elliptic-lanceolate to elliptic-obovate, membranous, subchartaceous or coriaceous, sometimes densely punctate beneath, usually glabrous or very minutely pilose on venations beneath, acute, obtuse or acuminate, with margins entire or subundulate, attenuate, rounded, cordate or subcordate; petioles glabrous, pubescent or puberulous, but often eventually glabrescent. *Inflorescence* cymose; cymes loose and few flowered in axils of upper leaves or aggregated in a broad terminal corymbose thyrse, branches glabrous, pubescent or minutely puberulous, ultimate ones 3-flowered; peduncles slender, glabrous or puberulous; bracts foliaceous, petiolate, lanceolate or elliptic, glabrous or somewhat pubescent on both surfaces; bracteoles lanceolate, sessile. *Flowers* pedicellate, often galled; pedicels slender glabrous or minutely puberulous. *Calyx* campanulate, glabrous or varying to puberulous outside, glabrous and glandular inside; lobes lanceolate, acute, about as long as tube or rather longer; tube wider at top. *Corolla* white or creamy white, hypocrateriform or infundibular, glabrous; tube slender; lobes elliptic-oblong or ovate. *Stamens* exserted; filaments inserted about $\frac{2}{3}$ above base of corolla-tube, white, filiform, glabrous; anthers oblong-ellipsoid, with 2 parallel lobes free in lower half. *Ovary* globose, glabrous, 1-2 mm diameter; style exserted, white, filiform, glabrous, with shortly bifid stigma. *Fruit* globose-obovoid, 5-15 mm diam., purple or purple-black when mature in fresh state, blackish when dry, fruiting calyx bright- or dark-red, expanding to 25 mm diam.

Distribution

A native of Australia, Papua New Guinea and Irian Jaya. Cultivated in Australia, South Africa, Sri Lanka and India as an ornamental and specimen plant.

Comments

C. floribundum is an extremely variable polymorphic species. In Australia, the popular names for this species are "Lolly Bush" and "Smooth *Clerodendron*".

Affinities

C. floribundum closely resembles *C. longiflorum* Decne. var. *glabrum* Munir as its leaves and inflorescence are glabrous; calyx deeply 5-lobed, glandular inside; corolla white, glabrous and non-glandular, not hairy inside the tube. Nevertheless, *C. floribundum* may easily be indentified by its leaf-blades only 30-130 by 15-55 mm and flowers being much smaller; calyx 5-10 mm long; corolla-tube 15-35 mm long and style 30-60 mm long only. In *C. longiflorum*, the leaf-blades are 60-260 by 30-150 mm; calyx 7-18 mm long; corolla-tube 50-100 mm long and style 65-105 mm long.

There are a few characters in common between *C. floribundum* and *C. inerme*. Both species have somewhat similar shaped glabrous leaf-blades, glabrous calyx and corolla. The latter species, however, may easily be distinguished by its scandent habit, the calyx being truncate and glandular outside; corolla-tube villous inside; stamens and style are pink-purple and the ovary glandular.

4a. var. *floribundum*.

C. floribundum R. Br., Prodr. Fl. Nov. Holl. (1810) 511; Sprengel, Syst. Veg. 2 (1825) 759; Walp., Rep. Bot. Syst. 4 (1845) 105; Schauer in A. DC., Prodr. 11 (1847) 671, p.p.; Benth., Fl. Aust. 5 (1870) 63, p.p.; F. Muell., Fragm. 9 (1875) 5; Syst. Cens. Aust. Pl. 1 (1882) 103; Bailey, Synop. Qld Fl. (1883) 381; Proc. Roy. Soc. Qld 1 (1884) 71; C. Moore, Cens. Pl. N.S.W. (1884) 52; Palmer, Proc. Roy. Soc. N.S.W. 17 (1884) 108; Bailey, Qld Woods (1888) 93;

F. Muell., Sec. Syst. Cens. Aust. Pl. I (1889) 173; Schumann in Schumann & Hollr., Fl. Kais.-Wilh. Land (1889) 122; Bailey, Cat. Pl. Qld (1890) 36; Tate, Handb. Fl. Extratrop. S. Aust. (1890) 156, 254; C. Moore, Handb. Fl. N.S.W. (1893) 357; Tepper, Bot. Centralbl. 54 (1893) 260; Tate in Horn. Sc. Exped. Cent. Aust. III (1896) 175; Bailey, Qld Fl. 4 (1901) 1183, p.p.; Schumann in Schumann & Lauterb., Nachtr. Fl. D. Südsee (1905) 371; Dixson, Pl. N.S.W. (1906) 236; Bailey, Qld Agric. Journ. 27 (1911) 67; Bailey, Comp. Cat. Qld Pl. (1913) 386; Maiden & Betche, Cens. N.S.W. Pl. (1916) 178; Ewart & Davies, Fl. N. Territory (1917) 238; H.J. Lam, Verbenac. Malay. Archip. (1919) 258; C. White & Francis, Proc. Roy. Soc. Qld 38 (1927) 257; Domin, Biblioth. Bot. 29 (1928) 558, p.p.; R. Anderson, Trees N.S.W. (1947) 272; Webb, C.S.I.R. Bull. No. 232 (1948) 167; Francis, Aust. Rain Forest Trees (1951) 367, 454; Mold., Résumé Verbenac. etc. (1959) 200, 207, 208; Beard, W. Aust. Pl. edn 2 (1970) 113; Mold., Fifth Summary Verbenac. etc. 1 (1971) 335, 345, 349; Court, Cat. Liv. Pl. Nat. Bot. Gard. Canb. (1980) 81; Mold., Phytologia Mem. Sixth Summary Verbenac. etc. (1980) 325, 334, 339; Baines, Aust. Pl. Gen. (1981) 97; J. Green, Cens. Vasc. Pl. W.A. (1981) 89; S. Jacobs & Pickard, Pl. N.S.W. (1981) 209; Munir in Jessop, Fl. Cent. Aust. (1981) 297; Mold. in Dassan. & Fosb., Fl. Ceylon 4 (1983) 456, p.p. excl. syn.; Lassak & McCarthy, Aust. Medic. Pl. (1983) 30; Elliot & Jones, Encyc. Aust. Pl. 3 (1984) 49; Stanley in Stanley & E. Ross, Fl. S.E. Qld 2 (1986) 370, p.p.; D. Jones, Ornament. Rainforest Pl. Aust. (1986) 207, t. p. 215.

Description (Fig. 4)

A tall shrub or small tree, 1.5-6.5 m high. *Stem* glabrous or pubescent on young parts. *Leaves* narrowly elliptic or lanceolate, (3-) 4.5-10 (-13) cm long, (1.5-) 2-4 (-5.5) cm wide, subchartaceous, glabrous or minutely pilose on venation beneath, acute-acuminate towards apex, tapered towards base; petioles pubescent-puberulous, (5-) 7-20 (-30) mm long. *Inflorescence* a terminal corymbose thyrse; peduncles puberulous, slender, 2-5 cm long; bracts lanceolate, foliaceous, petiolate, pubescent, 15-25 mm long, 5-10 mm wide, on a petiole of 2-3 mm long; bracteoles lanceolate, sessile, 2-5 mm long. *Flowers* pleasantly scented; pedicels slender, puberulous, (4-) 5-10 (-14) mm long. *Calyx* campanulate, 5-10 mm long, puberulous outside, glabrous and glandular inside; lobes lanceolate, acute, (2-) 3-4 (-5) mm long, (1-) 2-2.5 mm wide at base; tube (2-) 3-4 (-5) mm long. *Corolla* white, hypocrateriform, glabrous; tube slender, (15-) 20-30 (-35) mm long, 1-2 mm diam.; lobes elliptic-oblong, 3-5 (-6) mm long, 2-3 (-4) mm wide. *Stamens* much exserted; filaments white, glabrous, filiform, (9-) 15-25 (-35) mm long; anthers 2-3 mm long. *Ovary* glabrous, 1-1.5 mm diam.; style much exserted, white, filiform, glabrous, 30-45 (-60) mm long. *Fruit* globose-obovoid, 5-10 mm diam., purple-black, glabrous; fruiting calyx dark-red, 12-20 mm diam.

Representative specimens (collections seen: Australian 70, non-Australian 4)

AUSTRALIA: QUEENSLAND: *Alkin s.n.*, Gympie, 1913 (Z); *Bevege s.n.*, Blackall Range, Cooloolabin via Yadina, undated (BRI 063778); *Blake 2814*, Petrie, 29 km N Brisbane, -x.1931 (BRI); *Blake 15350*, Gogango Range, near Edungalba, 27.ix.1945 (BRI, MEL); *Bowman s.n.*, Herbert Creek, undated (MEL 582981, MEL 582982); *R. Brown s.n.*, *J.J. Bennett no. 2314*, Littora Novae Hollandiae intro tropica, Harvey's Islands, 15.ix.1802 (BM, lectotype; BM, K, isolectotypes); *R. Brown s.n.*, *J.J. Bennett no. 2313*, Thirsty Sound, 1802-5 (E); *Byrnes & Clarkson 3782*, Tributary of Hazelwood Creek, 9.iv.1978 (BRI); *Clemens s.n.*, Mt Glorious, Moreton District, -i.1945 (L 95930582); *Dallachy s.n.*, Rockingham Bay, 14.vii.1844 (MEL 98090); *Dietrich 2169*, Rockhampton, 1864-66 (AD); *Gulliver 44*, Cape Kimberley, 1874 (MEL); *Helms 1449*, Howard, 1.xii.1921 (C); *Hyland 5829*, SE Chillagoe, 26.i.1972 (L, QRS); *Leichhardt s.n.*, Archer Mt, 16.viii.1843 (NSW 145174); *F. Mueller s.n.*, Port Denison, undated (MEL 98098); *F. Mueller s.n.*, Burdekin River, undated (MEL 98178); *Rawson s.n.*, Wooroolin, -ii.1965 (BRI 060232); *Rodway s.n.*, Bundaberg, undated (HO); *Stoddart 5002*, Lowrie Island, 29.x.1973 (BRI); *Thozet s.n.*, Expedition Range, 1878 (MEL 582833); *White s.n.*, Nerang River, -x.1917 (BRI 265676, NSW 145178); *White 9526*, Roma, Maranoa District, 25.x.1933 (BRI); *Wilkinson s.n.*, sources of the Thomson River, 1893 (MEL 98139).

NEW SOUTH WALES: *Campbell s.n.*, Tweed River, -ix.1900 (G); *Fawcett A32*, Richmond River, 1878 (MEL); *Hadley 7918/5*, Woodford Island, Clarence River, -x.1915 (NSW 145187); *Hambly s.n.*, Comboyne, 12.iii.1946 (NSW 145186); *Lawrence s.n.*, Urunga, -xi.1918 (NSW 145182); *Lyne s.n.*, Taree, 31.i.1919 (NSW 145184); *Martin P.S. 1353*, Cooper Creek Road, north of Mullumbimby, 8.xi.1967 (SYD); *Morris s.n.*, Nana Glen, -xi.1957 (NSW 145190); *Sieber 267*, Port Jackson, undated (W); *Tanner s.n.*, Lismore, -xi.1911 (NSW 145196).

WESTERN AUSTRALIA: *Cunningham 255*, Cape Pond & York Sound, 1820 (BM); *George 12665*, Mt Trafalgar, Prince Regent River, 25.viii.1974 (PERTH); *Lullfitz L6086*, Balmoral Station between Onslow & Roebourne, 27.iv.1968 (AD, PERTH); *Wilson 10986*, Bat Island, Bonaparte Archipelago, 26.vi.1973 (PERTH); *Wilson 11415*, Boongaree Isl. Prince Fredrick Harbour, 7.vii.1973 (PERTH).

PAPUA NEW GUINEA: *Eddowes & Kumul NGF 13126*, Brown River, Central District, 29.iii.1966 (A, BO, BRI, CANB, K, L, SING); *Havel & Kairo NGF 17288*, Lower Crooked Creek, Bulolo, 2.x.1963 (A, BO, BRI, BISH, CANB, K, L, NSW, PNH, SING, US); *Millar & Holtum NGF 15785*, near Watut, subdistrict Wau, Morobe district, 16.viii.1963 (A, BO, BRI, CANB, K, L, PNH, NSW, SING, UH).

Distribution and ecology (Map 5)

In Australia, *C. floribundum* var. *floribundum* is found chiefly in Queensland, New South Wales and Western Australia. The localities in Queensland are mainly in the eastern coastal region, particularly in the area between Cape York Peninsula and New South Wales border. Further from coastal areas, a few inland localities are near Mitton Creek (a tributary of Gregory River), Longreach and Roma. One off-shore locality is at Lawrie Island on the east coast of Cape York Peninsula and another at Harvey's Island in the Torres Strait. So far, it has not been recorded from west-coast of Cape York Peninsula, Gulf of Carpentaria region or any part of Northern Territory where its presence seems most likely. In New South Wales, the distribution is in the coastal area between the Queensland border and Sydney. Distribution in Western Australia is mainly along the west-coast of Kimberley region where it is known to occur between 14° and 16°S and between 124° and 126°E. The only known locality outside this area is near Balmoral Station between Onslow and Roebourne.

Collections from Papua New Guinea are the only ones examined from outside Australia.

Growing on sandy or stony soils often associated with "banks of rivers" in rainforest. Also on "sandstone boulders" and in "semi-deciduous thicket".



Map 5. Distribution of *C. floribundum* var. *floribundum* Δ.

Comments

C. floribundum was based on Robert Brown's three different collections from northern and eastern parts of Queensland, and northern part of Northern Territory. Of these, three duplicates of his collection (J.J. Bennett no. 2314) from Northumberland Islands are preserved in Herb. BM, E and K. All three duplicates have large elliptic glabrous leaves and glabrous inflorescence. Since the shape and size of leaves and glabrous inflorescence are the characters of *C. floribundum* var. *ovatum*, the above (syntype) specimens from Northumberland Islands have been referred to var. *ovatum*. The typical form of *C. floribundum* has narrow-lanceolate leaves with petioles and inflorescence being pubescent. These characters were found in the syntypes from Harvey's Island, of which a lectotype has been chosen for the typical variety.

C.T. White's collection (no. 9526) in Herb. BRI has not only comparatively much smaller leaves, smaller inflorescence and flowers, but also abnormal flower-parts. In some flowers the number of calyx- and corolla-lobes are at least seven each, and the number of stamens up to eight.

Moldenke (1959, 1971) erroneously regarded *C. medium* R. Br. as a synonym of *C. floribundum*. Subsequently (1978, 1980, 1983) he recorded *C. medium* as a variety of *C. floribundum*, apparently without examining their types in Herb. BM and K. During present investigation, *C. medium* is found to have densely pubescent-tomentose leaves and a congested tomentose inflorescence. Since these characters are typical of *C. tomentosum* (Vent.) R. Br., *C. medium* has been placed in the synonymy of the former species. In general, *C. floribundum* is an exceedingly variable species distinguished from *C. tomentosum* by the absence of pubescence, lax inflorescence, acute calyx-lobes and slightly longer corolla-tube.

Bentham (1870) and Moldenke (1959, 1971, 1980) reported this species from South Australia, but its occurrence there has not been confirmed.

According to Edward Plamer (1884), "two sticks of this plant are used for drills to make fire with" by the aborigines. Its wood is reportedly close-grained and light coloured.

In Australia, the common name for this species is "Lolly Bush", and within Queensland it is named by some as "Thurkoo of Cloncurry Aborigines".

R.B. Jone's un-numbered collection (NSW 145183) from "Burrengbar", New South Wales, may have come from Burrenbah near the Queensland border. The locality "Burrengbar" has not been found in any available atlas, while Burrenbah is within the distribution range of this species.

4b. var. *attenuatum* (R. Br.) Mold., Phytologia 39 (1978) 236; Sixth Summary Verbenac. etc. (1980) 334, 390; in Dassan. & Fosb., Fl. Ceylon 4 (1983) 457.

Type: R. Brown s.n. (J.J. Bennett no. 2311), Hunter River, Newcastle, New South Wales, Australia, 1802-1805 (BM, holotype!).

C. attenuatum R. Br., Prodr. Fl. Nov. Holl. (1810) 511; Sprengel, Syst. Veg. 2 (1825) 759; Walp., Rep. Bot. Syst. 4 (1845) 105; Schauer in A. DC., Prodr. 11 (1847) 671; Benth., Fl. Aust. 5 (1870) 64; Kuntze, Rev. Gen. Pl. 2 (1891) 506.

Type: As for C. floribundum R. Br. var. *attenuatum* (R. Br.) Mold.

C. floribundum auct non R. Br.: Domin, Biblioth. Bot. 89 (1928) 1112, p.p., quoad syn. *C. attenuatum* R. Br.; Mold., Résumé Verbenac. etc. (1959) 260, p.p., quoad syn. *C. attenuatum* R. Br.; Fifth Summary Verbenac. etc. 1 (1971) 460, p.p., quoad syn. *C. attenuatum* R. Br.

C. ovalifolium auct non (A. Juss.) Bakh.: Bakh. in H.J. Lam & Bakh., Bull. Jard. Bot. Ser. 3, 3 (1921) 95, p.p., quoad syn. *C. attenuatum* R. Br.



Fig. 5. Habit sketch and range of variation in leaf form of *Clerodendrum floribundum* R. Br. var. *attenuatum* (R. Br.) Mold. (A & C, *R. Brown s.n. J.J. Bennett no. 2311*: BM, holotype; B, *M. Gray 4421*: CANB; D, *J.A. Henderson 147*: MEL; E, *R.D. Hoogland 8606*: BRI). A, habit sketch of a flowering branch; B-E, range of variation in leaf form.

Diagnosis

Var. *attenuatum* is distinct from other varieties of *C. floribundum* in its leaf-blades being elliptic to obovate-elliptic, acute at tip, cuneate towards base, glabrous all over; petiole pubescent; inflorescence pubescent-tomentose, with more or less congested flowers; peduncle and pedicel pubescent; calyx pubescent outside, glabrous and glandular on the inner surface.

Description (Fig. 5)

A tall shrub or small tree, 3-8 m high. *Stem* with soft, flaky, grey-brown bark. *Leaves* with blades elliptic or obovate-elliptic, acute apex, cuneate towards base, chartaceous or subcoriaceous, glabrous, (35-) 45-140 (-175) mm long, (25-) 30-80 (-100) mm wide; petiole pubescent, (10-) 15-40 (-55) mm long. *Inflorescence* dense, pubescent-tomentose; primary lateral peduncles pubescent, 10-45 mm long. *Flowers* pedicellate, more or less congested; pedicels pubescent, 5-12 mm long. *Calyx* deeply lobed, pubescent outside, glabrous and glandular on inner surface, 7-10 mm long; lobes acute, 3-5 mm long; tube 4-5 mm long. *Corolla* white or cream-white, glabrous, 30-40 mm long; tube cylindrical, 25-35 mm long, 1.5-3 mm diam. *Stamens* exerted, white, glabrous. *Ovary* globose, glabrous; style exerted, glabrous, white, 40-50 mm long. *Fruit* obovoid or somewhat globose, glabrous, glossy, purple-black or blue-black, 5-12 mm long, 5-8 mm diam. at top; fruiting calyx purple-red, 10-25 mm diam.

Representative specimens (Collections seen: Australian 62, non-Australian 5)

AUSTRALIA: NORTHERN TERRITORY: *Allen 483*, Daly River, 16.vi.1920 (NSW); *Bleeser 262*, Darwin, -iv.1927 (NSW); *Cunningham 289*, Port Hurd, Bathurst Island, 1818 (MEL); *Dunlop 3454*, Melville Island, 18.iv.1973 (CANB, DNA, NT).

QUEENSLAND: *Borman s.n.*, Capricorn Group Isl., undated (MEL 98156); *Dallachy s.n.*, Rockingham Bay, undated (MEL 98171); *Dietrich s.n.*, near Brisbane River, 1863-1865 (BRI, MO, W); *Gray 4421*, Mt. Glorious, 38 km W Brisbane, 2.xii.1957 (CANB, MEL); *Heatwole 571*, Murray Island, Torres Strait, 18.vii.1974 (QRS); *Henderson, Moriarty & Swan H2215*, c. 15 km N Proserpine, 21.vii.1974 (BRI); *Michael s.n.*, Johnston River, -ix.1917 (BRI); *Mitchell s.n.*, Kamerunga Nursery, Cairn, -viii.1911 (NSW 145173); *Moriarty 1815*, Eastern fall of Mt Dryander, 21.vii.1974 (QRS); *F. Mueller s.n.*, Port Denison, undated (MEL 98145); *O'Shanesy 145*, Rockhampton, 1.vi.1867 (MEL); *Simmonds s.n.*, Tamborine Mt, -x.1919 (BRI); *Smith 4146*, Fairmead, 27.x.1948 (BRI); *Verreaux 690*, Moreton Bay, 1844-1846 (LE); *Webb & Tracey 6392*, Fraser Island, -v.1964 (BRI); *Webb & Tracey 6955*, Bamaga at tip of Cape York Peninsula, 1962 (BRI); *White s.n.*, Macpherson Range, -i.1919 (BRI 266129); *White 12163*, Long Island, 18.vii.1935 (BRI); *Young 11*, Maryborough, undated (BRI); *Young s.n.*, Grenville Cape, -vii.1943 (BRI).

NEW SOUTH WALES: *R. Brown s.n. J.J. Bennett no. 2311*, Hunter River, Newcastle, 1802-1805 (BM, holotype!); *Henderson 80*, Richmond River, -xi.1867 (MEL 98086, MEL 98138, MEL 98172); *Hoogland 8606*, near Vallery, c. 21 km SW Coffs Harbour, 28.x.1962 (A, BRI, CANB, K, L, NSW); *Jozer s.n.*, Hastings River, 1864 (MEL 98361); *Lean s.n.*, Kyogle, -xii.1917 (NSW 145198); *C. Moore s.n.*, Tweed River, -v.1867 (K); *C. Moore 205*, Clarence River, 1867 (MEL, NSW 145193); *Telford 2287*, 3.2 km from Elands towards Wingham, 25.xi.1970 (CBG); *Webb & Tracey s.n.*, Whian Whian, 1933 (BRI 037582).

PAPUA NEW GUINEA: *Eddowes & Kumul NGF 13126*, Brown River, c. 1.6 km from Forest Station, New Guinea, 29.iii.1966 (A, BO, BRI, CANB, K, L, LAE, SING); *Pullen 6619*, Rubulogo Creek, c. 29 km N Port Moresby, 7.iv.1967 (A, B, BO, BRI, BISH, CANB, E, G, K, L, LAE, P, PNH, SING, TNS, US); *Streimann & Kairo NGF 39398*, Palenkwa, Golden Pines, district Morobe, 24.iv.1969 (A, BISH, BO, BRI, CANB, K, L, NSW, PNH, SING, US).

Distribution and ecology (Map 6)

In Australia, *C. floribundum* var. *attenuatum* is known to occur in Northern Territory, Queensland and New South Wales. Distribution in all these states is chiefly in the high rainfall areas. In Northern Territory, this variety occurs in the far north-western parts around Darwin, and on Bathurst Island and Melville Island. Distribution in Queensland is scattered along the east coast from the tip of Cape York Peninsula to north-eastern tip of New South Wales. The major concentration, however, appears to be in the areas between Townsville and Proserpine, and from Maryborough up to the New South Wales border. A few off-shore collections have

come from Capricorn Island Group and Frazer Island. The northern-most locality within Queensland is on Murray Island in the Torres Strait. In New South Wales, the distribution is in the north-eastern coastal area between the Queensland border and Hunter River near Newcastle. The best known localities, however, are in the north-eastern tip of the state, in the area called Macpherson-Macleay Overlap.

Collections from Papua New Guinea are the only ones examined from outside Australia.

Growing "on stony slopes" in usually poorly developed rainforest.

Comments

In view of the pubescent-tomentose inflorescence, several collections of this taxon have been identified by others as *C. tomentosum* (Vent.) R. Br. To some extent, the inflorescence of var. *attenuatum* has the aspect of *C. tomentosum*, but var. *attenuatum* differs in its leaf-blades, corolla and inner surface of calyx being glabrous. The inflorescence and leaf-blades in *C. tomentosa* are always much more densely tomentose, with hairs often perceptible to touch.

Generally more than one type specimen or their duplicates have been examined by Robert Brown for each *Clerodendrum* species described in his "Prodromus Florae Novae Hollandiae". In the case of var. *attenuatum*, however, which was also described by Robert Brown as *C. attenuatum*, only one type specimen (in Herb. BM) is available for examination. The type specimen was not in the type-folder but mixed with the general BM collections of *C. floribundum*. It has the annotation in Robert Brown's handwriting, and was possibly used



Map 6. Distribution of *C. floribundum* var. *attenuatum* ▲.

by him in preparing the protologue of *C. attenuatum*. The specimen is particularly complete and well preserved, and has been accepted here as the holotype of this taxon. If in the future any type duplicate is discovered, a lectotypification of this taxon would be needed.

A few collections from New South Wales were annotated by F. Mueller as "*C. tomentosum* var. *glabra*", but his varietal name was apparently never published.

In Dietrich's collection no. 2173, the young apical leaves and outer surface of corolla-lobes are somewhat puberulous like *C. tomentosum*. Nevertheless, the mature leaf-blades, the inner surface of calyx and the corolla-tube are throughout glabrous.

This taxon seems to be an intermediate form between *C. tomentosum* and *C. floribundum*. The majority of its characters, however, are similar to those of *C. floribundum*. For more detail see "affinities" under var. *attenuatum*.

Affinities

Of all varieties of *C. floribundum*, var. *attenuatum* is nearest to the typical variety as its leaf-blades are elliptic, cuneate towards base, acute at apex, glabrous; petiole pubescent; peduncles, pedicels and outside of calyces also pubescent. However, var. *attenuatum* may easily be distinguished by its mostly larger leaf-blades measuring up to 175 by 100 mm; inflorescence being more densely pubescent-tomentose, and the flowers are much more congested than in var. *floribundum*. There are several characters in common between var. *attenuatum* and *C. tomentosum*. Both taxa have a densely pubescent-tomentose inflorescence, congested flowers, pubescent petioles and pedicels and also a densely pubescent outer surface of the calyx. *C. tomentosum* can, however, be easily identified by its always densely tomentose leaf-blades, the densely pubescent-tomentose outer surface of the corolla and densely tomentose inner surface of the calyx-lobes.

4c. var. *coriaceum* (R. Br.) Mold., *Phytologia* 39 (1978) 236; Sixth Summary Verbenac. etc. (1980) 334, 391; in Dassan. & Fosb., *Fl. Ceylon* 4 (1983) 457.

Lectotype: R. Brown s.n., J.J. Bennett no. 2316, North Coast Islands, Australia, 1802-1805 (BM, lectotype designated here; BM, K — isolectotypes!); J. Banks & D. Solander s.n., Endeavour River, Queensland, 1770 (BM, 2 syntypes!).

C. coriaceum R. Br., *Prodr. Fl. Nov. Holl.* (1810) 511; Sprengel, *Syst. Veg.* 2 (1825) 759; Walp., *Rep. Bot. Syst.* 4 (1845) 105; Schauer in A. DC., *Prodr.* 11 (1847) 671; Benth., *Fl. Aust.* 5 (1870) 64, p.p. excl. descr. "pubescent leaves"; Bakh. in H.J. Lam & Bakh., *Bull. Jard. Bot. Buitenzorg, Ser. III*, 3 (1921) 95, as syn. of *C. ovalifolium* (Juss.) Bakh.; Mold., *Résumé Verbenac. etc.* (1959) 272, pro syn.; Fifth Summary Verbenac. etc. 1 (1971) 442, pro syn.

Type: As for above.

C. cardiophyllum F. Muell., *Fragm.* 3 (1863) 144; Bakh. in H.J. Lam & Bakh., *Bull. Jard. Bot. Ser. 3*, 3 (1921) 95, p.p., pro syn. *C. ovalifolium* (A. Juss.) Bakh.

Type: J. Macd. Stuart s.n., in virgultis *Acaciae aneurae* (Mulga scrub) *Australiae Centralis*, 1860 (MEL 98182, syntype!); F. Waterhouse s.n., ad paludes Daly Waters, N.T., undated (MEL 98183, syntype!).

C. floribundum auct non R. Br.: Ewart & Davies, *Fl. N. Territory* (1917) 238, p.p., quoad spec. *G.F. Hill 88 & 91* from Finke River, Northern Territory.

C. album Ridley ex Mold., known *Geogr. Distrib. Verbenac. edn 1* (1942) 69 & 89, nom. nud.

Typification

C. floribundum var. *coriaceum* is based on two different collections from the northern parts of Australia. Of these, one by Robert Brown (s.n., J.J. Bennett no. 2316) from "North Coast Islands" comprises at least 3 duplicates, and another by Joseph Banks & Daniel Solander (s.n.) from Endeavour River, Queensland, has at least 2 duplicates. Apparently, the duplicates of

these collections were seen by Robert Brown and possibly used by him in preparing the original diagnosis of this taxon. Since he did not select one specimen as a type, it is, therefore, necessary to choose a lectotype for this name. Of all the syntypes, a duplicate of Robert Brown's above collection (s.n., J.J. Bennett no. 2316) in Herb. BM is particularly complete and well preserved and is chosen here as the lectotype of this taxon.

Diagnosis

Var. *coriaceum* is distinguished from other taxa of this species in its leaf-blades being cordate, ovate-cordate or almost truncate at the base, coriaceous, glabrous, generally larger than any other variety measuring (40-) 50-150 (-180) by (25-) 40-90 (-140) mm, and the inflorescence somewhat lax and glabrous.

Description (Fig. 6)

A shrub or small tree, 1-6 m high. *Stem* glabrous, bark yellowish-grey, corky and deeply fissured. *Leaves* cordate, ovate-cordate or almost truncate at base, sometimes almost orbicular, coriaceous, glabrous, (40-) 50-150 (-180) mm long, (25-) 40-90 (-140) mm wide, entire, subacute or obtuse; petioles glabrous, (25-) 35-70 (-90) mm long. *Inflorescence* lax, glabrous; peduncles glabrous, 30-75 (-90) mm long. *Flowers* lax; pedicels glabrous, (4-) 5-15 (-20) mm long. *Calyx* deeply lobed, glabrous, glandular on inner surface, 4-10 mm long; lobes lanceolate, acute, often slightly longer than tube. *Corolla* cream-white, 25-45 mm long, glabrous. *Stamens* exserted, white, glabrous. *Ovary* glabrous; style exserted, white, glabrous. *Fruit* globose-obovoid, 5-10 mm long, narrowing towards base, glabrous, purple-black when ripe; fruiting calyx purple-red, 10-20 mm diam.

Representative specimens (Collections seen: Australian 157, non-Australian 21)

AUSTRALIA: WESTERN AUSTRALIA: *Donnell s.n.*, near the Ord River, 1886 (MEL 98121); *George 15422*, Djaluwon Creek, near S end of Lake Gregory, 26.iv.1979 (CANB, K, NT, PERTH); *N. Johnson 33*, near Kununurra, 13.ii.1977 (PERTH); *Lullfiz L6087*, Broome, north-west, 20.v.1968 (PERTH); *Wilson s.n.*, Careening Bay, S Coronation Island, 25.v.1972 (PERTH).

NORTHERN TERRITORY: *Adams 868*, c. 8 km NW Katherine, 6.ii.1964 (BRI, CANB, K, L, NSW, NT); *Angeles s.n.*, Banjo Jungle, Melville Island, 17.iii.1977 (DNA); *Bake s.n.*, Darwin, 22.vi.1943 (BRI 265752-3); *Byrnes 2455*, South Alligator Uranium Mine, 5.i.1972 (CANB, DNA, K, L, NT); *Chippendale 4572*, Docker Creek, 13.vi.1958 (AD, BRI, L, NT, PERTH); *Chippendale 5687*, 93 km NE Tanami, 12.iv.1959 (AD, BRI, CANB, L, MEL, NT); *Cleland s.n.*, Pine Hill, 11.viii.1936 (AD); *Dunlop 2961*, Gulf of Carpentaria, Maria Island, 12.vii.1972 (NT); *Forde 84*, Benstead Creek, c. 51 km ENE Alice Springs, 11.ii.1956 (AD, BRI, CANB, MEL, NT, PERTH); *Fox 2569*, Little Nourlangie Rock, 25.ii.1977 (BRI, CANB, DNA, NT); *Gardner 11603*, Narwietooma, 11.iii.1953 (MEL, NT, PERTH); *Henry 18*, c. 35 km NNE New Tanumbirini Homestead, 3.vi.1971 (NT); *Ising s.n.*, Macdonald Station, 25.vii.1936 (AD); *Johnson 74*, 9.6 km NE of Coles Hill, 21.x.1956 (AD, NT); *Lazarides 7972*, c. 21 km E El Sharana Mine, 3.iii.1973 (B, BRI, CANB, L, NT, PERTH); *Lothian 277*, Bank of Derwent Creek, 155 km WNW Alice Springs, 1954 (AD); *Maconochie 115*, Entire Creek, 13.iv.1967 (AD, BRI, MEL, NT); *Maconochie 1124*, c. 21 km NE Top Springs, 19.v.1971 (AD, CANB, CBG, NT, PERTH); *Martensz AE685*, c. 2.5 km SW Cannon Hill, 2.ii.1973 (BRI, CANB, DNA, NT); *Nicholls 506*, Todd River, Mosquito-Barstard bore crossing, 31.iii.1967 (NT); *Parker 666*, 2 km W South Alligator River, 18.vii.1975 (MO, NT); *Perry 652*, c. 27 km NE Tennant Creek, 28.iv.1948 (BRI, CANB); *Perry 3436*, c. 27 km NW Ooratippra Station, 14.iii.1953 (BRI, CANB, NT, PERTH); *Rankin 1911*, Native Gap, 12.iv.1979 (CANB, DNA, NSW); *Tate 16*, Adelaide River, 1882 (MEL 98140); *Webb & Tracey 12252A*, NE Coast of Van Diemen, Melville Island, -v.1978 (BRI); *S.A. White s.n.*, Hermannsburg, undated (AD); *Winkworth 322*, 38.5 km WNW Haasts Bluff, 9.vi.1954 (BRI, CANB, NT, PERTH).

QUEENSLAND: *Atena c.28*, Bruce Highway S Cardwell near Waterfall Creek, 21.iii.1976 (QRS); *Armit 317*, South Barnard Island, undated (MEL); *Bancroft s.n.*, Palm Island, undated (BRI); *Blake 17944*, Barkly Downs Station, 27.v.1947 (BRI, CANB); *Carolin 8731*, 1.6 km S Karumba, 19.iv.1974 (SYD); *Domin 8145*, Harveys Creek, -xii.1909 (PR); *Everist 7365*, 80 km W Yarakka, 1.viii.1963 (BRI, LE); *Fitzalan s.n.*, Port Denison, undated (MEL 98180, MEL 98181, MEL 98184); *MacGillivray s.n.*, Lizard Island, -viii.1848 (K); *MacGillivray s.n.*, Gregory River near Gregory Downs, -viii.1928 (BRI); *McKee 9449*, S Tinaroo Creek road, 22.5 km from Mareeba, 1.v.1962 (BRI, CANB); *F. Mueller s.n.*, Rockhampton, undated (MEL 98484); *Ollerenshaw 1069 & Kratzing s.n.*, 3 km N Reid River, 30.vii.1974 (BRI, CBG, NT); *Persieh s.n.*, Endeavour River, 1883 (MEL 98495); *Persiez s.n.*, Cooktown, 1877 (MEL 98434); *Scarth-Johnson 85A*, Walker's Creek near Normanton, -v.1976 (BRI); *Smith 4291*, Mt Woodhouse,

c. 40 km SW Ayer, 19.vi.1949 (BRI, L); *Tindale & Aitken s.n.*, Bentinck Island, Gulf of Carpentaria, 29.v.-18.vi.1963 (AD); *Webb & Tracey 8340*, Claudie River, -.x.1968 (BRI); *Wrigley & Telford 98*, White Cliff Point, N Cairns, 28.v.1972 (CBG).

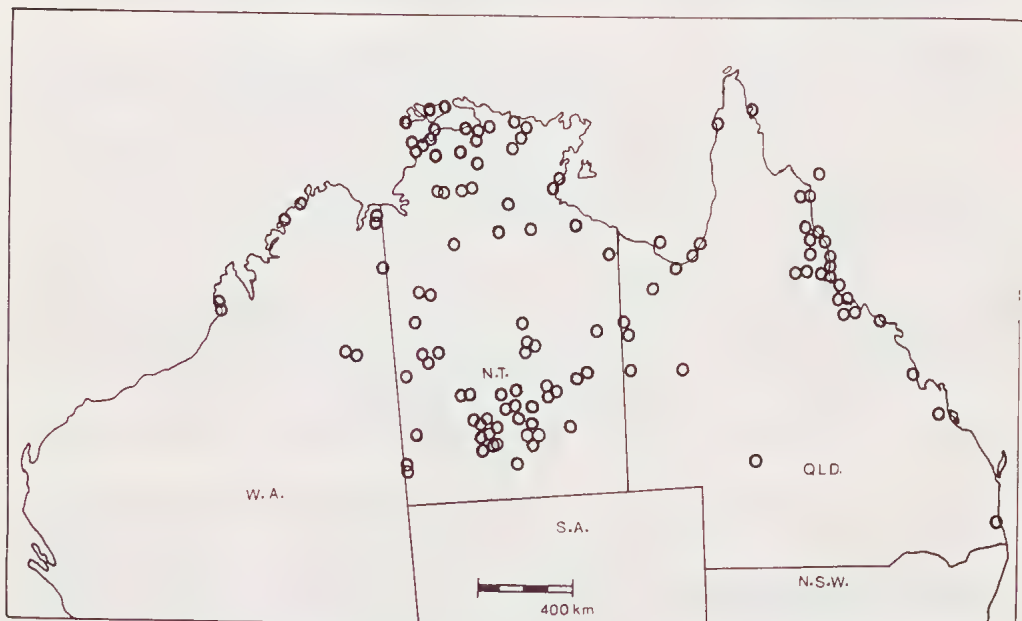
PAPUA NEW GUINEA: *Armit s.n.*, British New Guinea, 1895 (MEL 98546); *Chalmers s.n.*, near Port Moresby, 1878 (MEL 98593); *Darbyshire 646*, c. 13 km W Kanosia Plantation, Papua, 12.vii.1962 (A, BO, BRI, K, L, LAE, US); *Gray NGF 12906A*, Boroko, Central District, Papua, 13.ii.1962 (BRI, CANB, L, LAE); *Pullen 3529*, S of Rogers Airstrip, 17.viii.1962 (CANB, LAE); *Schodde 2648*, near SW base of Mt Lawes, Central District, Papua, 26.vii.1962 (A, CANB, L, LAE).

Distribution and ecology (Map 7)

In Australia, *C. floribundum* var. *coriaceum* is known to occur in Western Australia, Northern Territory and Queensland. The distribution in Western Australia is chiefly in the Kimberley region except for one record each from near Roebuck Bay and near Lake Gregory. In the Northern Territory, this variety is widely distributed throughout the State, ranging from the northern wet tropics of Arnhem Land to the southern dry parts bordering South Australia. It is known to occur in all major areas of the Northern Territory excepting the interior of the Tanami Desert and the Simpson Desert. From off-shore parts of the State, it has been recorded from Melville Island and Bathurst Island.

In Queensland, var. *coriaceum* is known to occur chiefly in the areas along the east coast, southern coastal area of the Gulf of Carpentaria and in the western part of the State bordering Northern Territory. Along the east coast, the northern-most locality is near Iron Range in the Cape York Peninsula and the southern-most near Brisbane. The major distribution, however, is in the area between Cooktown and Rockhampton. From off-shore islands, this variety has been reported from Bentinck Island in the Gulf of Carpentaria, and from Lizard Island, Palm Island and the Fisherman Islands along the east coast. So far, it has not been recorded from the southern part of the State, and the distribution in the mid-interior areas is scarce.

Collections from Papua New Guinea are the only ones examined from outside Australia.



Map 7. Distribution of *C. floribundum* var. *coriaceum* ○.

Growing on a wide range of substrates but often recorded from "sandy soils" sometimes with "limestone outcrops". Often recorded from "banks of watercourses" but usually in "savannah" or "woodland". Several collections are known from "rocky hillside in pockets of soils" and from "sandstone boulders close to escarpment".

Comments

After examining the types of *C. coriaceum* R. Br. and *C. ovatum* R. Br., it appears that the characters erroneously mentioned by Bentham (1870, p. 64) under *C. ovatum* are, in fact, those of *C. coriaceum*, and those noted under *C. coriaceum* are of *C. ovatum*. Bentham (1870) admitted that he "did not see flowers, and without the corolla there appears to be no positive character to distinguish". In his opinion, "*C. ovatum* and *C. coriaceum* are both much like the garden specimens figured by Ventenat as *Volkameria tomentosa*". In fact *C. ovatum* and *C. coriaceum* are so close to each other that sometimes it was rather difficult to distinguish the intermediate forms from one or the other. In the present studies, therefore, *C. ovatum* and *C. coriaceum* are treated as two varieties of *C. floribundum* R. Br. According to the present circumscription of this species, both var. *coriaceum* and var. *ovatum* are very distinct from *Clerodendrum tomentosum*. The pubescent-tomentose syntypes of *C. ovatum*, however, are being treated here as belonging to *C. tomentosum* (Vent.) R. Br. (= *Volkameria tomentosa* Vent.).

In the protologue of *C. coriaceum* the leaves are described as having tomentose petioles. This character has not been found in the type specimens nor in any other collection referred to this taxon.

Moldenke (1980) regarded this taxon endemic to Queensland. During present investigation, however, it has been recorded from Western Australia, Northern Territory and Queensland. Moreover, several new collections have been examined from Papua New Guinea as well.

Galled flowers are commonly found in var. *coriaceum*.

Affinities

Amongst the infraspecific taxa of *C. floribundum*, var. *coriaceum* is nearest to var. *ovatum* in its petioles, peduncles, pedicels and calyces being glabrous, and inflorescence fairly lax. Nevertheless, var. *coriaceum* may readily be indentified by its leaf-blades being cordate, ovate-cordate or almost truncate at the base, and distinctly coriaceous in texture. The leaf-blades in var. *ovatum* are ovate with generally rounded base and chartaceous to sub-coriaceous in texture.

4d. var. *ovatum* (R. Br.) Domin, *Biblioth. Bot.* 89 (1928) 1112.

Lectotype: *R. Brown s.n.* (*J.J. Bennett no. 2317*), North Coast, Gulf of Carpentaria, South Wellesley Islands, Queensland, 18.xi.-4.xii.1802 (BM, lectotype designated here!; BM, LE 2 sheets, MEL 98119 — isolectotypes!).

C. ovatum R. Br., *Prodr. Fl. Nov. Holl.* (1810) 511, excl. descr. "B. Folia calycesque pubescentes" & syntype *R. Brown s.n.*, *J.J. Bennett no. 2315*, Allen Island, Gulf of Carpentaria, Qld; Sprengel, *Syst. Veg.* 2 (1825) 758, p.p. excl. syn. *Ovieda ovalifolia* A. Juss. & loc. Coromandel; Walp., *Rep. Bot. Syst.* 4 (1845) 105, p.p. excl. descr. "B. Folia Calycesque pubescentes"; Schauer in A. DC., *Prodr.* 11 (1847) 671, p.p., excl. descr. "B. Folia Calycesque pubescentes"; Benth., *Fl. Aust.* 5 (1870) 64, p.p., excl. syn. *C. cardiophyllum* F. Muell.; Bailey, *Qld Fl.* 4 (1901) 1184, p.p., excl. syn. *C. cardiophyllum* F. Muell.

Type: As for above.

C. floribundum auct. non R. Br.: F. Muell., *Fragm.* 6 (1868) 152, p.p., quoad syn. *C. ovatum* R. Br.; Benth., *Fl. Aust.* 5 (1870) 63, p.p., quoad descr. & spec. *Banks & Solander s.n.*, *Dallachy s.n.*, *Fitzalon s.n.* and *F. Mueller s.n.*; Ewart &

O.B. Davies, Fl. N. Territory (1917) 238, p.p., quoad spec. *Henne s.n.*; Domin, Biblioth. Bot. 89 (1928) 1112, p.p., quoad syn. *C. ovatum* R. Br.; Mold., Résumé Verbenac. (1959) 273, p.p., quoad syn. *C. ovatum* R. Br.; Fifth Summary Verbenac. etc. 1 (1971) 452, 464, p.p., quoad syn. *C. ovatum* R. Br.; R.J. Hend. in Carr (ed.), Sydney Parkinson Artist in Cook's Endeav. Voy. (1983) 167, t. 160; Elliot & Jones, Encycl. Austr. Pl. 3 (1984) 49 & t.; Stanley in Stanley & Ross Fl. SE Qld 2 (1986) 370, p.p., quoad descr.

C. floribundum R. Br. var. *latifolium* F. Muell., Fragm. 9 (1875) 5, nom. nud.; Domin, Biblioth. Bot. 89 (1928) 1112; Mold., Phytologia Mem. II, Sixth Summary Verbenac. etc. (1980) 334, 385, 388, 424.

C. ovalifolium auct. non (A.L. Juss.) Bakh.: Bakh. in H.J. Lam & Bakh., Bull. Jard. Bot. Buitenzorg, Ser. III, 3 (1921) 95, p.p., quoad syn. *C. ovatum* R. Br.; C. Gardner, Enum. Pl. Aust. Occ. III (1931) 112; Beard, Descrip. Cat. W. Aust. Pl. (1965) 91; *ibid* 2 nd edn (1970) 113; J. Green, Cens. Vasc. Pl. W. Aust. (1981) 89; Lassak & McCarthy, Aust. Medic. Pl. (1983) 31.

Ovidea ovalifolia auct. non. A.L. Juss.: Bakh. in H.J. Lam & Bakh., Bull. Jard. Bot. Ser. 3, 3 (1921) 95. (See comments).

C. populneum E. Beer & H.J. Lam, Blumea 2 (1936) 224, fig. 2, **syn. nov.**; Mold., Résumé Verbenac. etc. (1959) 200; Phytologia 31 (1975) 391; Fifth Summary Verbenac. etc. 1 (1971) 335, 453; Phytologia Mem. II, Sixth Summary Verbenac. etc. (1980) 325, 335.

Type: *L.J. Brass 3781*, Baroka, Central Division, Papua New Guinea, April, 1933 (L, holotype!; NY, isotype).

Typification

C. floribundum var. *ovatum* is based on Robert Brown's three different collections from the Islands of the Gulf of Carpentaria. Since the author did not select any one specimen of these collections as a type, it is necessary to choose a lectotype for this name. Out of three collections, the one (with J.J. Bennett no. 2315) bearing pubescent-tomentose leaves and inflorescence, is found to belong to *C. tomentosum* (Vent.) R. Br., and is, therefore, excluded from *C. floribundum* and *C. ovatum*. Of the remaining two collections, one with J.J. Bennett no. 2317 has at least 5 duplicates and the other with no. 2316 only one. A duplicate of J.J. Bennett no. 2317 in Herb. BM is particularly complete and well preserved and therefore selected here as the lectotype for this taxon.

Diagnosis

Var. *ovatum* is distinct from other taxa of *C. floribundum* in its leaf-blades being ovate, rounded or broadly cuneate at the base, chartaceous or subcoriaceous. Similar to var. *coriaceum*, this variety is also glabrous with lax inflorescence, but the shape and texture of leaves easily distinguish it from that taxon.

Description (Fig 6)

A shrub or small tree, 1-5 m tall. *Stem* with a longitudinally fissured yellowish-grey corky bark, glabrous. *Leaves* ovate, rounded or somewhat broadly cuneate at base, chartaceous or subcoriaceous, glabrous, (30-) 50-130 (-175) mm long, (20-) 35-90 (-110) mm broad, entire, obtuse or subacute; petiole glabrous, (20-) 30-50 (-72) mm long. *Inflorescence* lax, glabrous; peduncles glabrous, (15-) 25-50 (-90) mm long. *Flowers* lax; pedicels glabrous, 3-10 mm long. *Calyx* reddish, deeply lobed, glabrous, glandular on inner surface, 5-9 mm long, red and accrescent in fruit; lobes narrow lanceolate, acute, longer than tube. *Corolla* white or cream-white, glabrous, 25-45 mm long. *Stamens* exserted, white, glabrous. *Ovary* glabrous; style exserted, glabrous, white. *Fruit* obovoid or somewhat globose, 5-10 mm long, 5-8 mm diam. at top, glabrous, glossy, blue-black or purple-black; fruiting calyx red, 10-25 mm diam.

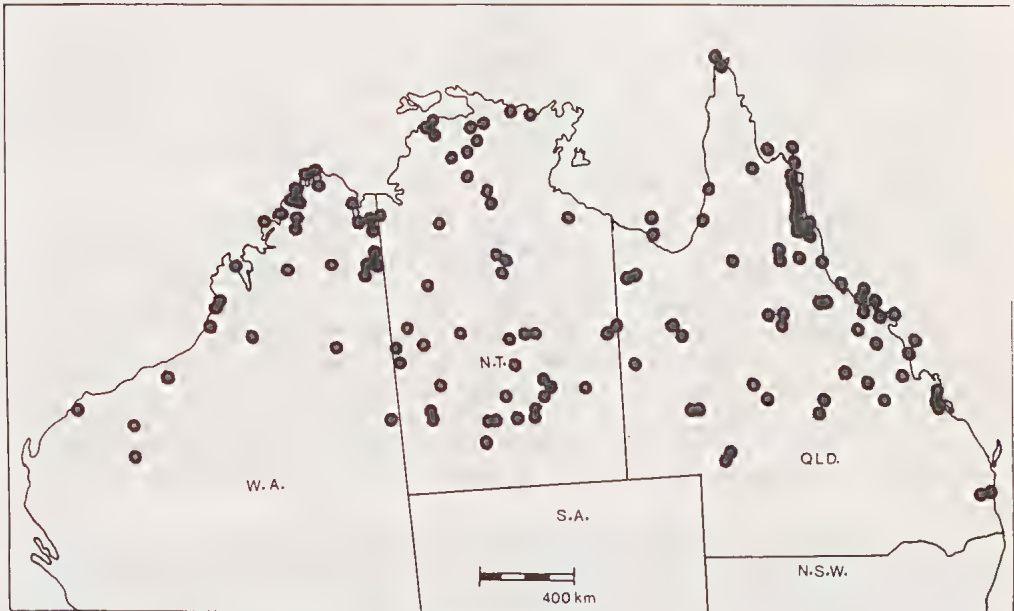
Representative specimens (Collections seen: Australian 221, non-Australian 4)

AUSTRALIA: WESTERN AUSTRALIA: *Beard 4898*, between Carey Junction and Sandy Blight Junction, 26.vii.1967 (King's Park Perth, PERTH); *Beard 8261*, Bougainville, on plateau of NW Kimberley, 10.ix.1978 (PERTH); *Bradshaw & Allen s.n.*, Prince Regent River, 1891 (MEL 98130); *Crawford 87*, Kalumburu, 11.i.1974

(PERTH); *Gardner 7381*, Thompson Spring, Argyle Downs, Ord River, 9.vi.1944 (PERTH); *George 14673*, McLarty Hills, Great Sandy Desert, 6.viii.1977 (CANB, K, PERTH); *Hartley 14436*, base of Northern Carr Boyd Ranges bordering the Ord River, 10.iii.1978 (CANB, L, NT, PERTH); *Kenneally 5152*, Camp Creek South, Mitchell Plateau, 19.vi.1976 (CANB, PERTH); *Lazarides 5114*, 16 km SE Tableland Station, 18.iv.1955 (BRI, CANB, NT); *Pullen 10689*, Kununurra-Lake Argyle road, near Spillway Creek, 11.iv.1977 (CANB, LE, PERTH); *Forbes 2638*, Bungle Bungle massif, Piccaninny Creek V bend, 14.7 km more or less SSE (147°) Bungle Bungle Outcamp, 12.vii.1984 (AD, MEL); *Symon 10119*, 30 km SW Thangoo turnoff, 21.v.1975 (AD, PERTH); *Wilson 11376*, Boongaree Island, Prince Fredrick Harbour, 5.vii.1973 (PERTH).

NORTHERN TERRITORY: *Adams 868*, 8 km NW Katherine, 6.ii.1964 (BRI, CANB, K, L, NSW, NT); *Bulter 34*, Ehrenberg Range, 96.5 km of Sandy Blight Junction, -.v.1967 (PERTH); *Byrnes 199*, 145 km S Katherine, 29.ii.1967 (L, NT, PERTH); *Chippendale 1133*, 24 km E Tarlton Downs Homestead, 9.v.1955 (AD, CANB, NT); *Dunlop 3394*, Nourlangie Creek, 28.ii.1973 (CANB, DNA, NSW, NT); *Fox 2509*, Deaf Adder Gorge, 21.ii.1977 (CBG, MO, NE); *Henry 316*, Gardens Station, 7.i.1972 (CANB, CBG, NT); *Latz 6004*, Newcastle Waters Stn., 30.v.1975 (AD, BM, CBG, NT); *Lazarides & Adam 180*, near Plum Tree Creek, c. 75 km ENE Pine Creek Township, 11.iii.1965 (B, CANB, E, K, L, NT, US); *Maconochie 572*, 32 km S Larimah, 18.ii.1968 (K, NT, NY, TEX); *F. Mueller s.n.*, Upper Victoria River, -.xii.1855 (MEL 98099, MEL 98150); *Parker 150*, The Devils Marbles, 21.iv.1970 (AD, MEL, NT); *Schwarz s.n.*, Macdonell Ranges, 1889 (MEL 98401); *Strong s.n.*, Bullock Head Waterhole, Georgina River, 31.viii.1984 (AD, NT); *Winkworth 428*, Vaughan Springs, 4.vii.1954 (CANB, NT).

QUEENSLAND: *Bailey s.n.*, Bentinck Island, -.vi.1901 (BRI); *Banks & Solander s.n.*, Endeavour River, 1770 (NSW 145168); *Blake 23309*, Cooktown, mouth of Endeavour River, 16.v.1970 (BRI, MEL); *Brass 422*, Gilbert River, -.iv.1925 (BRI, CANB); *Robert Brown s.n. (J.J. Bennett no. 2317)*, North coast, Gulf of Carpentaria, South Wellesley Island, 18.xi.-4.xii.1802 (BM, lectotype, BM, LE, MEL, isolectotypes); *Dallachy s.n.*, Rockingham Bay, 3.v.1867 (MEL 98146, MEL 98160, MEL 98162, MEL 98163, MEL 98170); *Everist 7386*, c. 25 km W Windorah, 1.viii.1963 (BRI, K); *Fitzalan s.n.*, Port Denison, undated (MEL 98097, MEL 98141, MEL 98142, MEL 98149, MEL 98151, MEL 98161, MEL 98167); *Heatwole 93*, Lizard Isl., Great Barrier Reef, 1.x.1967 (BRI); *Henne s.n.*, Whitsunday Island, undated (MEL 98169); *Macgillivray 90*, Sandy Cape & Bowen Port, undated (BM, CANB); *Macpherson 759*, Proserpine, -.iv.1935 (AD, BRI); *Perry 1100*, 35.5 km N Lawn Hill Station, 31.v.1948 (AD, BRI, CANB, NT, PERTH); *Scarth-Johnson 507*, Cloncurry, 27.viii.1970 (K); *Simmons s.n.*, Rockhampton, 1903 (NSW 145179); *Sutherland 81*, Flinders Island, 8.x.1883 (MEL); *Telford 1942*, Bowen, Horseshoe Bay, 23.v.1970 (CBG); *Webb & Tracey 5543*, c. 2 km S Chewko turnoff on Mareeba-Atherton Rd, 17.i.1962 (BRI); *Webb & Tracey 7129*, Galloway Creek, Bamaga, at tip of Cape York Peninsula, 1962 (BRI); *Williams 80061*, Road between Valley of Lagoons and Ingham via Douglas Creek and Mt. Fox, 10 km W Douglas Creek, 15.iv.1980 (BRI).



Map 8. Distribution of *C. floribundum* var. *ovatum* ●.

PAPUA NEW GUINEA: *Armit s.n.*, Arora River, 1884 (MEL 98105); *Bell 65*, Bootless Inlet, Central District, Papua, 15.iv.1965 (MEL); *Poole 437*, Port Moresby, -iv.1922 (BRI); *Pullen 6936*, Tavai Creek area, c. 69 km SE Port Moresby, 7.v.1967 (CANB, L, LAE).

Distribution and ecology (Map 8)

In Australia, *C. floribundum* var. *ovatum* is known to occur in Western Australia, Northern Territory and Queensland. Distribution in Western Australia is chiefly in the Kimberley region, with a few disjunct localities near Broome and Dampier along the Northern and North West Coastal Highways. Further inland, it has been reported from near the sources of the Fortescue River and in the area adjacent to Northern Territory. In the Northern Territory, this variety is widespread all over the state. The major known occurrences, however, are in Arnhem Land, MacDonnell Ranges and along the Stuart Highway. A few scattered localities are also in the areas along the borders of Western Australia, Northern Territory and Queensland. In Queensland, var. *ovatum* is widely distributed deep inland and along the east coast. The overall occurrence is chiefly to the north of 24°S, though a few collections from further south have been reported from Windorah and north of Brisbane. It has been recorded from several off-shore Islands along the east coast and near the Great Barrier Reef. The most northern localities of this variety are at the tip of Cape York Peninsula, and on Horn Island in the Torres Strait. It has also been recorded from near Mitchell River and Gilbert River along the west coast of Cape York Peninsula. In the Gulf of Carpentaria, this variety has been recorded from Wellesley Islands.

Collections from Papua New Guinea are the only ones examined from outside Australia.

Recorded from a wide range of habitats ranging from "course red sandy soil" to "heavy soil" from near-desert conditions with spinifex to "vineforest or "rainforest"

Comments

Bakhuizen (1921) recorded *C. floribundum* R. Br., *C. ovatum* R. Br., *C. medium* R. Br. and *C. attenuatum* R. Br. as doubtful synonyms under *C. ovalifolium* (A. Juss.) Bakh. which was based on *Ovieda ovalifolia* A. Juss. According to the protologue, the type of *Ovieda ovalifolia* came from Pondicherry along the Coromandel Coast of southern India where *C. floribundum* does not occur. Since the type of *Ovieda ovalifolia* has not been seen, the precise identity of this species is not known. However, it is certain from the distribution pattern that *C. floribundum* does not occur in India. It is most likely, therefore, that *Ovieda ovalifolia* and *C. floribundum* are not conspecific. According to Moldenke (1959, 1971, 1980) and the present investigations, *C. floribundum* is found only in Australia and Papua New Guinea.

Sydney Parkinson's illustration (Plate 160) of *C. floribundum*, prepared during Cook's Endeavour Voyage in 1770, should be identified as *C. floribundum* var. *ovatum* (R. Br.) Domin. According to Henderson (1983), "Parkinson's sketch was prepared from one of the 14 or 15 new plants Banks and Solander hastily collected on Palm Island just on dusk on 7 June 1770. Judging from their specimens at the British Museum (Natural History) they had also collected the species at Thirsty Sound and were to collect it again at Cape Grafton and Endeavour River. In writing it up in his manuscript Solander associated the plant with *Volkameria*, a genus now considered to belong to *Clerodendrum*. The large numbers of insects often associated with the showy flower-heads must have been what prompted him to propose *V. insectorum* for the species. Brown, however, chose to highlight the floriferous nature of the species".

Moldenke (1975) for the first time reported *C. populneum* E. Beer & H.J. Lam from Northern Territory, Australia. The examination of its type has revealed that this species is conspecific with *C. floribundum* and has, therefore, been placed in the synonymy of the latter. In 1980, Moldenke recorded *C. floribundum* var. *ovatum* as a synonym of *C. floribundum* var. *latifolium* F. Muell. which being nomen nudum is an invalid (varietal) name.

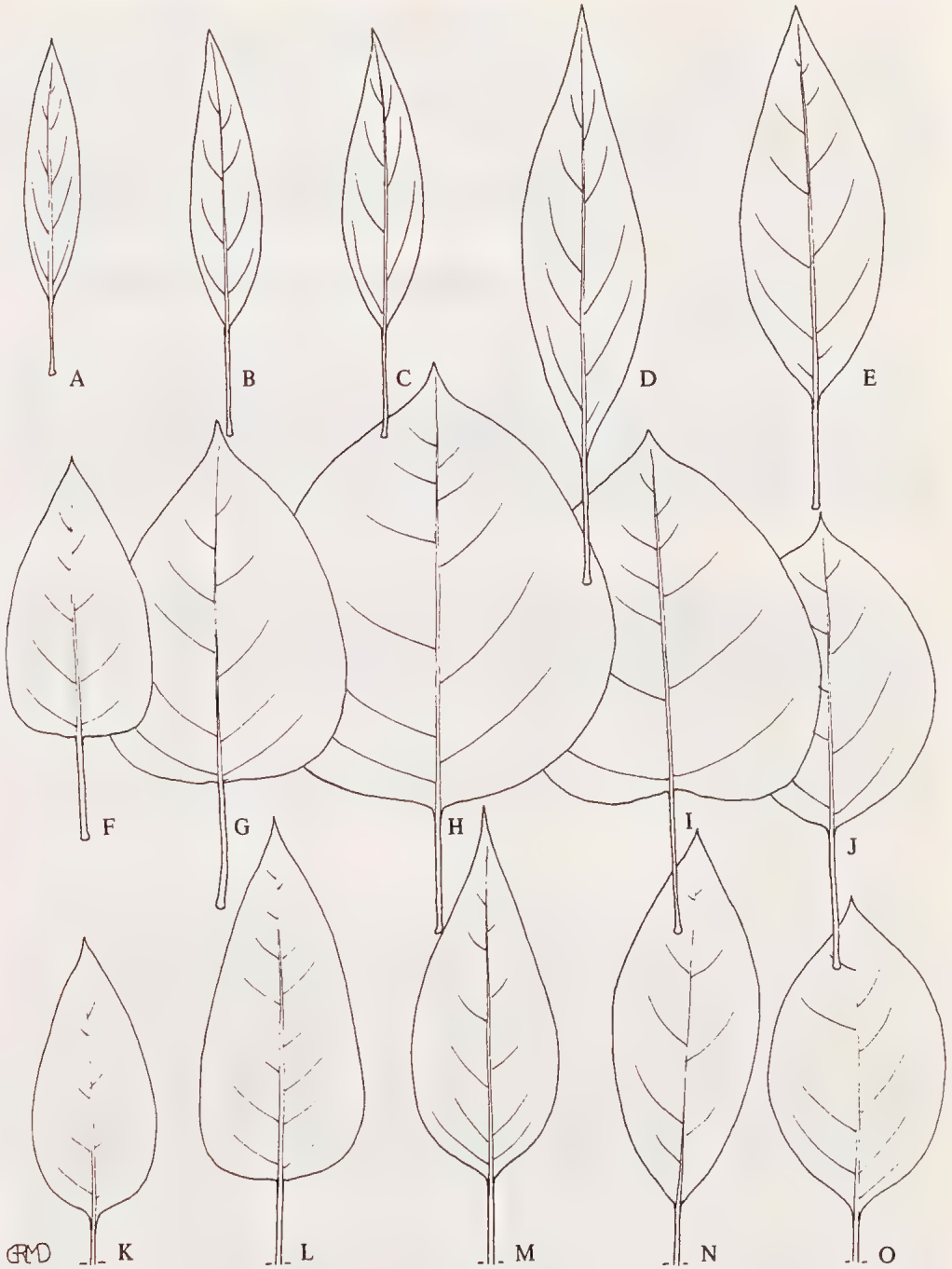


Fig. 6. Range of variation in leaf form of *Clerodendrum floribundum* R. Br. (A-E, var. *angustifolium* Mold.; F-J, var. *coriaceum* (R. Br.) Mold.; K-O, var. *ovatum* (R. Br.) Domin). A, S.T. Blake 23495: BRI; B, R. Pullen 10928: PERTH; C, A. Dietrich 1986: AD; D, L.A. Craven 3165: CANB; E, E.M. Jackes s.n.: JCT/S-7074; F, M. Lazarides 7972: CANB; G, L.G. Adams 868: CANB; H, P. Martensz AE540: BRI; I, R. Pullen 3594: CANB; J, T.B. Croat 52469: MO; K, R. Brown s.n., J.J. Bennett no. 2317: BM, type of var. *ovatum*; L, M. Lazarides 868: L; M, L.A. Craven 3892: CANB; N, E. Fitzalan s.n.: MEL 98097; O, K. Macpherson 759: BRI.

Due to lax disposition of leaves, a few herbarium specimens have been identified by F. Mueller as "*C. sparcifolium*". This name, however, was never published by F. Mueller.

One of D.E. Symon's collection (no. 10119) from Western Australia has puberulous petioles and pedicels, but the shape and texture of leaf-blades and semi-lax appearance of inflorescence is similar to that of var. *ovatum*.

In Telford's collection (no. 1942) from Queensland, the leaf-blades are somewhat cuneate towards the base and calyx and corolla are mostly 6-lobed. This abnormality has not been found in any other collection of this species.

Of all the infraspecific taxa of *C. floribundum*, the var. *ovatum* seems to be the most widespread variety of this species.

Affinities

Var. *ovatum* is nearest to var. *coriaceum*. For similarities and differences see "affinities" under the latter taxon. There are a few characters common between var. *ovatum* and var. *angustifolium*. The latter, however, can easily be distinguished by its leaf-blades being lanceolate or narrowly elliptic-lanceolate, long cuneate towards the base and generally 15-30 mm wide at mid-point.

4e. var. **angustifolium** Mold., *Phytologia* 37 (1977) 22; Sixth Summary Verbenac. etc. (1980) 334; in Dassan. & Fosb., *Fl. Ceylon* 4 (1983) 456, 457.

Type: C.T. White 8675, Torrens Creek, North Queensland, Australia, 19.iii.1933 (NY, holotype!; BRI, G, NY — isotypes).

Diagnosis

Var. *angustifolium* differs from the typical variety by its petiole, peduncle and calyx being glabrous; leaf-blades narrow-lanceolate or very narrowly elliptic-lanceolate and long-cuneate towards the base.

Description (Fig. 6)

A shrub or small tree, (1-) 2-6 (-7) m high. *Stem* with rough to flaky bark often slightly fissured. *Leaves* glabrous; leaf-blades narrow-lanceolate or very narrowly elliptic-lanceolate, acute, long cuneate towards base, punctate on lower surface, (30-) 50-100 (-150) mm long, (10-) 15-30 (-45) mm wide; petioles (10-) 15-30 (-40) mm long, glabrous. *Inflorescence* more or less lax, glabrous; primary lateral peduncles (10-) 15-40 (-50) mm long, glabrous. *Flowers* white, lax; pedicels glabrous, 2-6 (-10) mm long. *Calyx* deeply lobed, glabrous all over, glandular on inner surface, 5-6.5 mm long; lobes acute, 3-4 mm long; tube 2-3 mm deep. *Corolla* creamy-white, glabrous, 25-45 mm long; tube cylindrical, 20-35 mm long, 1-2 mm diam. *Stamens* white, much exerted, glabrous. *Ovary* glabrous; style exerted, white, 35-65 mm long. *Fruit* obovoid or obovoid-globose, glabrous, glossy, purple-black or blue-black, 7-10 mm long, 5-8 mm diam. at top; fruiting calyx red or purplish-red, 10-18 mm diam.

Representative specimens (Collections seen: Australian 115, non-Australian 0)

AUSTRALIA: QUEENSLAND: *Armit* 525 & 588, Gilbert River, undated (MEL); *Auld* 12, Roundstone Creek, c. 21 km W Moura on levee near creek, 9.vi.1969 (BRI); *Bancroft* 118, Stannary Hills, -.xii.1908 (BRI); *Batianoff & McDonald* 352, Farnborough Beech, 17.vii.1977 (BRI); *Birch* s.n., sources of Thomson River, 1871 (MEL 98425); *Blake* 23495, Cooktown, Point Saunders, 23.v.1970 (CANB, L, MEL, PERTH); *Boorman* s.n., Rockhampton, -.viii.1982 (NSW 145176); *Bowman* s.n., Cape River, undated (MEL 98092, MEL 98147); *Briggs* 1156, 14.48 km SE Blackall, 14.viii.1967 (NSW); *Clemens* s.n., Spring Vale, -.iv.1946 (BRI 004783, BRI 265764); *Craven* 3165, c. 15 km from Collinsville on Bowen Road, 6.iv.1975 (BRI, CANB); *Dallachy* 424, Rockhampton, 10.iii.1863 (MEL 532417);

Fitzalan s.n., Port Denison, undated (MEL 98087, MEL 98093, MEL 98153); *Fitzalan s.n.*, Mt Elliot, undated (MEL 98476); *Gittins 480*, Mt. Douglas, -v.1962 (AD, BRI); *Godwin C1365*, Featherbed Range, 2.v.1980 (BRI); *Gray 1693*, Walsh River, 11 km toward Wrotham Park from Mungana, 9.v.1980 (AD, QRS); *R.W. Johnson 3091*, Budgerygar, 11.xi.1975 (BRI); *S. Johnson s.n.*, Ravenswood, Burdekin River, 1887 (MEL 98398); *Moriarty 1358*, Rockhampton-Duaringa Road, 4.viii.1973 (BRI); *Pajmans 3512*, mouth of Barratta Creek, lower Burdekin Valley, 6.vi.1980 (CANB); *Perry 3586*, 26 km ENE Torrens Creek, 21.vi.1953 (AD, BRI, CANB, MEL, NT, PERTH); *Puttock & Wilson UNSW 13570*, Budgerygar, Cheviot Range, 14.ix.1982 (AD, UNSW); *Randall 2*, Coalstoun Lake, 15.x.1979 (BRI); *Speck 2007*, c. 3.2 km NE Westwood, Port Curtis (BRI, CANB, L); *Story & Yapp 184*, 48 km ENE Capella, 17.vii.1962 (CANB); *Webb & Tracey 10155*, Black Rock, 26 km S Lynd Junction on Hann Highway between Hughenden and Mt. Garnet, 19.v.1970 (AD, BRI); *White 8675*, Torrens Creek, 19.iii.1933 (BRI, G, NY — isotypes of var. *angustifolium* Mold.).

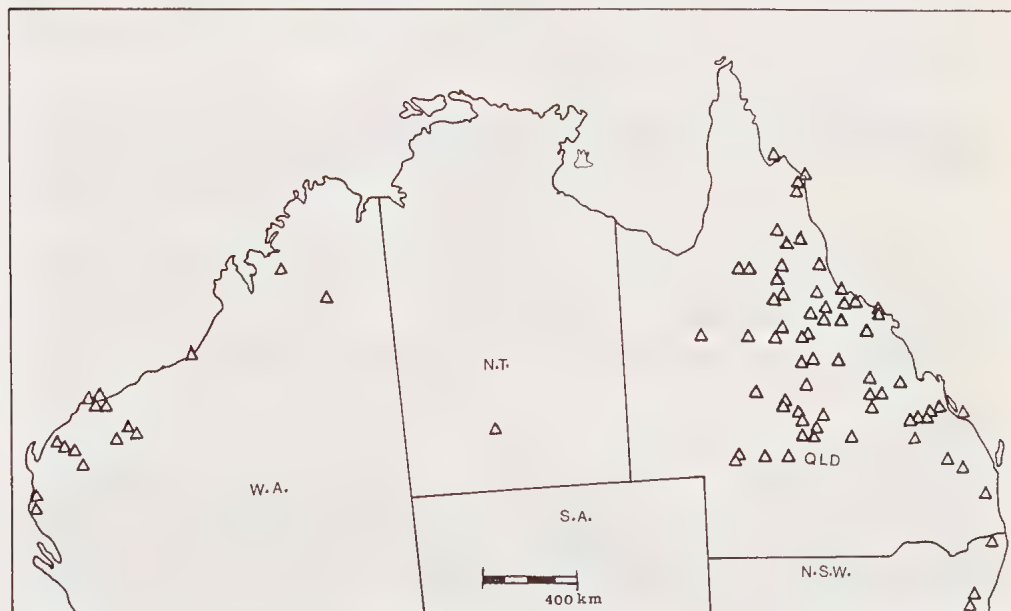
NEW SOUTH WALES: *Boorman s.n.*, Dorrigo, -xii.1909 (NSW 145189); *Birch & Zelling s.n.*, Tait's Creek, 1892 (MEL 98390); *Forsyth s.n.*, Murwillumbah, 18.x.1898 (NSW 145197).

NORTHERN TERRITORY: *Williams 6757*, Ellery Gorge, Macdonnell Range, 15.v.1975 (AD).

WESTERN AUSTRALIA: *Birch s.n.*, between Bowen Downs and Mueller's Range, undated (MEL 98387); *Blockley 169*, Dales Gorge, Wittenoom area, 26.iv.1966 (Kings Park Perth, PERTH); *Burbidge 5999*, Stony Creek, Hamersley Range, 6.v.1958 (AD, CANB, PERTH); *Cusack 156*, Harding River, 1895 (MEL); *Forrest & Carey s.n.*, between De Grey River & Lagrange Bay, 1879 (MEL 98374); *J. Forrest s.n.*, Jones Creek & George River, S Roebourne, 1878 (AD, MEL 98424); *J. Forrest s.n.*, Gascoyne River, 1882 (MEL 98305); *Giles s.n.*, between the rivers Ashburton & Gascoyne, undated (MEL 98482); *F. Mueller s.n.*, Nickol Bay, undated (MEL 98312); *Pullen 10928*, Yampire Gorge, Hamersley Range National Park, E of Wittenoom, 30.iv.1977 (BRI, CANB, PERTH); *Robinson s.n.*, Karragoolgaranna, Barlee Range, 10.ix.1959 (PERTH); *Royce 6546*, Barlee Range, Henry River, 17.viii.1961 (PERTH); *Wittwer 2305*, 15 km S Nanutarra, 21.vi.1980 (Kings Park Perth).

Distribution and ecology (Map 9)

C. floribundum var. *angustifolium* seems endemic to mainland Australia. It has been recorded chiefly from the tropical areas of Western Australia, Queensland and New South Wales, with only one disjunct locality in the Macdonnell Ranges in the Northern Territory. In Western Australia, the distribution is mainly in the north-western areas and in the southern part of Kimberleys. The major occurrence within this range is between Broome and



Map 9. Distribution of *C. floribundum* var. *angustifolium* Δ.

Carnarvon, chiefly along North West Coastal Highway. It has not been recorded from the interior of Western Australia or the north-western half of Kimberleys where it is likely to occur.

The occurrence of this variety in the Northern Territory is based only on a solitary collection from Ellery Gorge, west of Alice Springs. It has not been reported from the tropical north (i.e. Arnhem Land area) where it is likely to be found. The distribution in Queensland is mainly in the mid-east of the State, with most localities between 15° and 26°S, and between 141° and 153°E. With the exception of one collection from Flinders Island in the Bathurst Bay, this taxon has not been recorded from any other part of Cape York Peninsula or the Gulf of Carpentaria. This variety is fairly well scattered inland, with the farthest locality near Windorah towards the South Australian border.

In New South Wales, this taxon has been recorded from the north-eastern tip of the State with two localities to the west of Coffs Harbour and one at Murwillumbah near the Queensland border.

Growing usually on "stony" or "boulder strewn" hillsides but also on dunes and usually associated with "woodland", "banks of creeks" or "dune scrub".

Comments

Var. *angustifolium* has been identified by many as *C. lanceolatum* F. Muell. which has more or less similar shaped narrow-lanceolate leaves and similar looking inflorescence. The major difference is that the leaves in *C. lanceolatum* are densely tomentose all over, and calyx-lobes are obtuse and tomentose outside as well as on the inner side.

One of W.A. Cusack's collection no. 156 (in Herb. MEL) from Harding River, Western Australia has some characters of var. *angustifolium* and some of *C. lanceolatum*. The glabrous branches, peduncles and leaves are like that of var. *angustifolium*, and the pubescent pedicels, calyces and corolla-lobes are similar to that of *C. lanceolatum*. The calyces in Cusack's collection, however, are 6-8-lobed and corollas 5-6-lobed. The number of calyx- and corolla-lobes is certainly abnormal, otherwise this collection seems to be an intermediate form between var. *angustifolium* and the species *C. lanceolatum*.

According to Moldenke (1980) this variety is endemic in Queensland. During present investigation, however, this taxon has been found in Western Australia, Northern Territory, Queensland and New South Wales. Notes with the type collection say that it is a fairly common shrub in rocky places and has faintly scented white flowers. In the protologue, Moldenke (1977) stated that "this variety differs from the typical variety of the species in its leaf-blades being narrowly elliptic, mostly 4-7 cm long and 1-3 cm wide, acuminate at the apex and acute or subacuminate at the base". During the present study, however, many leaves have exceeded the above quoted range of dimensions.

Galled flowers have been noticed in several collections of this variety.

Affinities

Among the infraspecific taxa of *C. floribundum*, var. *angustifolium* is nearest to var. *coriaceum* and var. *ovatum*. From both these varieties, however, var. *angustifolium* may easily be distinguished by its leaf-blades being lanceolate or narrowly elliptic-lanceolate, long cuneate towards the base and generally 15-30 mm wide at mid-point. The narrow lanceolate leaf-blades and the presence of glands on the inner surface of calyx in var. *angustifolia* are similar to those of *C. tomentosum* var. *lanceolatum* (F. Muell.) Munir. The latter, however, differs in its leaf-blades being pubescent-tomentose, calyx and corolla-tube pubescent-tomentose outside, and calyx-lobes pubescent on the inside.

5. *Clerodendrum tatei* (F. Muell.) Munir, comb. nov.

Lectotype: *R. Tate s.n.*, At the Twelve Mile, McKinlay River, Arnhem Land, Northern Territory, 1882 (MEL 602001, lectotype; AD, isolectotype).

Strobilanthes tatei F. Muell., Trans. & Proc. Roy. Soc. South Australia 5 (1882) 81, **basionym**; F. Muell., Syst. Cens. Aust. Pl. 1 (1882) 99; Sec. Syst. Cens. Aust. Pl. 1 (1889) 167; Ewart & Davies, Fl. N. Territory (1917) 252; L.S. Smith, Contrib. Qld Herb. No. 6 (1969) 20; R.M. Barker, J. Adelaide Bot. Gard. 9 (1986) 281.

Type: As for above.

Clerodendrum holtzei F. Muell., J. & Proc. Roy. Soc. N.S.W. 24 (1891) 75; Mold., Résumé Verbenac. etc. (1959) 148, 208, 264; Fifth Summary Verbenac. etc. 1 (1971) 247, 345, 446, 462; Sixth Summary Verbenac. etc. (1980) 237, 334; Dunlop, Checklist Vasc. Pl. N. Territory (1987) 79; R.M. Barker, J. Adelaide Bot. Gard. 9 (1986) 281, **syn. nov.**

Type: *Maurice Holtze s.n.*, [995 & 109], near Port Darwin, Northern Territory, 1890 (G 2 spec., K, LE, MEL 98245 — MEL 98250 six spec., NSW 2 spec., Z — syntypes!).

Description (Fig. 7)

Perennial herb or subshrub. *Stem* prostrate, decumbent or suberect, 15-40 cm long, cylindrical, pubescent. *Leaves* extremely variable in shape and size, sessile or with petiole 1-3 mm long, cordate, rhomboid-orbicular, ovate-elliptic, oblong or linear-lanceolate, entire, denticulate or deeply dentate, obtuse or shortly pointed, (10-) 15-45 (-55) mm long, (5-) 10-30 (-40) mm wide, pubescent-hirsute. *Inflorescence* thyrses, terminal and from axils of upper leaves; cymes three to several flowered; peduncles slender, not longer than subtending leaves, pubescent-hirsute, (10-) 15-30 (-40) mm long; bracteoles short, narrow, 1-3 mm long, 0.5-1 mm wide, pubescent. *Flowers* pedicellate; pedicels pubescent-hirsute, 2-7 mm long. *Calyx* campanulate, divided to more than halfway down into 5, occasionally 4 or 6, ovate or linear-lanceolate lobes, (3.5-) 4-8 (-10) mm long, glandular and pubescent-hirsute all over, often glands not distinct in mature flowers; lobes acute, (2-) 3-5 (-6) mm long, 1-2.5 mm wide near base; tube (1-) 2-3 (-4) mm long. *Corolla* white, pubescent-tomentose outside, villous inside tube, hairs protruding above opening of corolla-tube; tube cylindrical, (8-) 12-18 (-25) mm long; lobes glabrous inside, spreading, elliptic-oblong to obovate-orbicular, (5-) 7-12 (-14) mm long, (2-) 3-5 (-7) mm wide. *Stamens* exerted beyond corolla-tube; filaments inserted in corolla-throat, white, glabrous, filiform, 4-7 mm long; anthers ellipsoid-sagittate, oblong, with cells free up to middle, 1.5-2.5 mm long. *Ovary* glabrous, globose, 1-1.5 mm diam.; style exerted above corolla-tube, filiform, glabrous, (10-) 13-20 (-27) mm long. *Fruit* globose-obovoid, 4-lobed on top, glabrous, 5-10 mm diam., often shorter than accrescent calyx; fruiting calyx spreading, 10-15 mm diam.

Representative specimens (Collections seen: Australian 41, non-Australian 0)

AUSTRALIA: NORTHERN TERRITORY: *R.M. Barker 386*, 32.4 km from Winellie P.O. and 1 km N Elizabeth River on Stuart Highway, 1.v.1983 (AD); *Bowman 406 & Wilson s.n.*, Munmalary, 3.v.1986 (DNA); *Briggs 781*, Berrimah, C.S.I.R.O. Wildlife Research Laboratory, 30.iv.1983 (CBG); *Byrnes 1245*, Daly River Road, Foster Block, 19.xii.1968 (NT); *Byrnes 1269*, 14.4 km E Pine Creek, 9.i.1969 (BRI, NT); *Byrnes 2799*, c. 5 km NE Finnis River, 16.i.1973 (BRI, CANB, DNA, FRI-DWN, K, NT); *Byrnes & McKean B207*, 8 km NW Humpty Doo, 11.i.1972 (NT); *Calaby AE394*, vicinity of El Sharana, 17.i.1973 (CANB, NT); *Chippendale 7774*, c. 63 km S Darwin, 18.iii.1961 (BRI, MEL, NT); *Collins BC211*, Kapalga Ref 0920, 9.ii.1977 (CANB, DNA); *Cousins 78*, Flying Fox Creek area, 29.iii.1979 (DNA); *Eddy 5222*, c. 33 km S Darwin, 23.iii.1958 (CANB, NT); *Foelsche 14*, Jam Creek — near Brook's Creek, -i.1883 (AD, MEL); *Foelsche 29*, loc. cit., 29.i.1883 (AD, MEL); *Foelsche 122*, Finnis River, -i.1883 (MEL); *Gittins 2561*, 41 km from Pine Creek, on UDP Falls Road, -vii.1973 (BRI, NSW); *Holtze s.n.*, near Port Darwin, 1890 (G 2 spec., K, LE, MEL 98245 — MEL 98250, six spec., NSW, Z — syntypes of *C. holtzei* F. Muell.); *Lazarides 7883*, Mt Basedow, c. 26 km SSE Nourlangie Safari Camp, 27.ii.1973 (CANB); *Lazarides 7982*, c. 23 km SE Mt Basedow, 3.iii.1973 (CANB); *Lazarides & Adams 59*, c. 98 km NE Maranboy Police Station, 4.iii.1965 (CANB); *O.H. & J.R. Marshall s.n.*, Koongarra area, -xi.-xii.1978 (CANB); *McKean B174*, c. 30.5 km S Darwin, 12.xii.1971 (DNA); *McKean B224*, c. 21 km S Adelaide River, 15.i.1972 (NT); *McKee 8364*, Winellie near Darwin, 11.ii.1961 (BRI, CANB, L, NSW, NT); *Morgan 42*, Coomalie Creek, 7.ii.1971 (DNA); *Muspratt SSO251*, Noonamah area, 7.ii.1963 (DNA); *Muspratt SSO360*, Lake Deane, 5.i.1963 (DNA); *Parker 154*, Finnis River area, 12.viii.1973

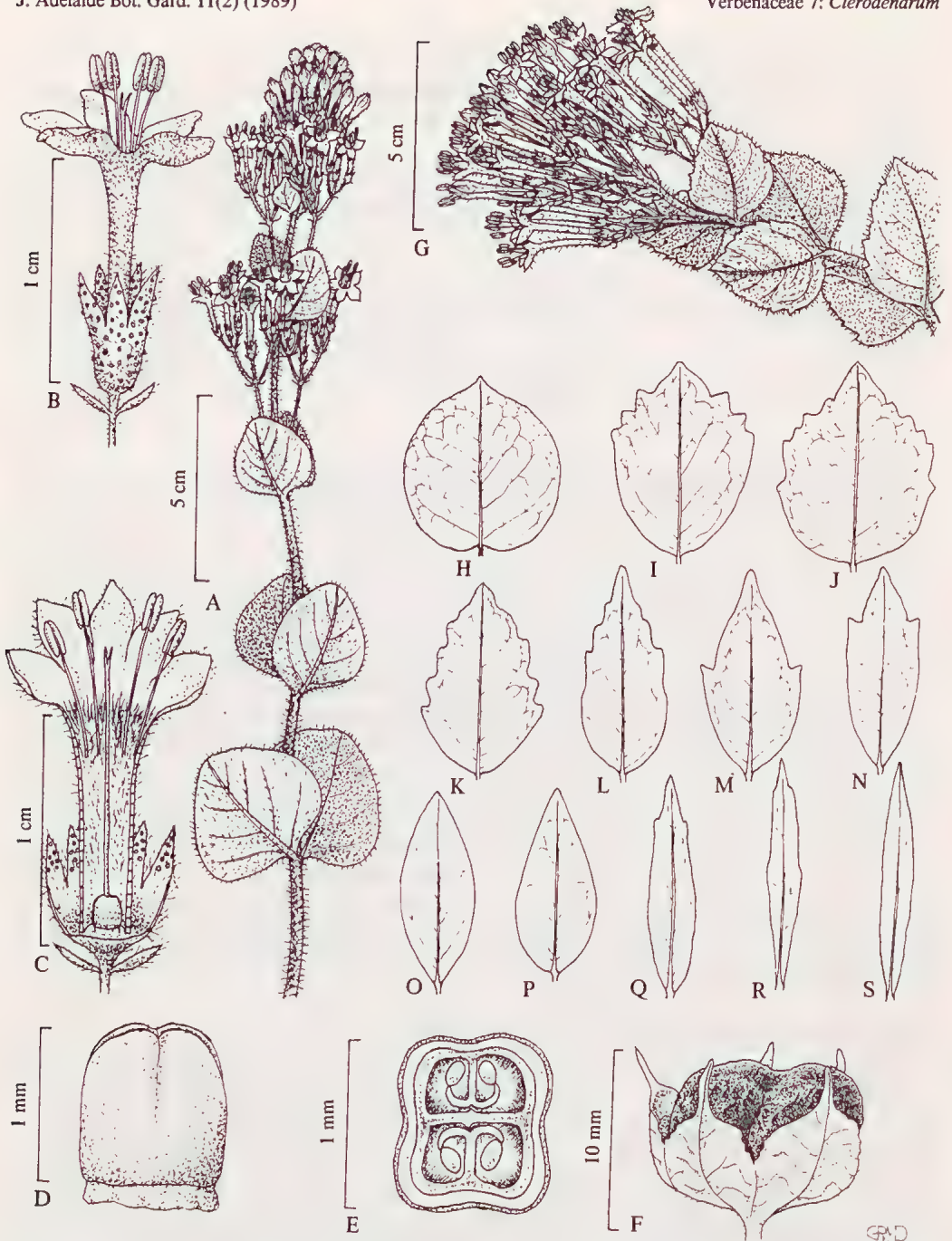


Fig. 7. *Clerodendrum tatei* (F. Muell.) Munir. Habit sketch and range of variation in leaf form. (A-E, *M. Holtze* s.n.: MEL98247; F, *C.R. Dunlop* 6084 & *J.A. Taylor* s.n.: DNA; G & J, *M. Lazarides* 7883: CANB; H, *G.M. Chippendale* 7774: NT; I, *R. Collins* BC211: DNA; K, *C.S. Robinson* R124: NT; L, *N.B. Byrnes* 1269: BRI; M, *D.J. Morgan* 42: DNA; N, *M. Parker* 154: MO; O, *N.B. Byrnes* 2799: CANB; P, *M. Parker* 328: CANB; Q, *N.B. Byrnes* 2799: DNA; R, *N. Byrnes* 2799: BRI; S, *N.B. Byrnes* 2799: NT). A, flowering branch with entire leaves and lax inflorescence; B, flower showing bracteoles and hairs outside calyx and corolla; C, flower with calyx and corolla longitudinally cut open showing androecium and gynoecium; D, ovary; E, transverse section of ovary; F, fruit with persistent calyx; G, flowering branch with dentate margined leaves and congested inflorescence; H-S, range of variation in leaf form.

(DNA, MO); *Parker* 328, Tortilla Flats, 17.i.1974 (BRI, CANB, NSW, NT); *Robinson* 124, 164 km Stuart Highway, 3.ii.1964 (DNA, NT); *R. Tate* s.n., at the Twelve Mile, McKinlay River, Arnhem Land, 1882 (MEL 602001, lectotype; AD isolectotype); *Telford* 7778 & *Wrigley* s.n., Kakadu National Park, 2 km Arnhem Hwy, along Jim Jim road, 20.iv.1980 (CBG); *Weston* (?) s.n., Darwin Aerodrum, 25.xi.1950 (BRI).

Distribution and ecology (Map 10)

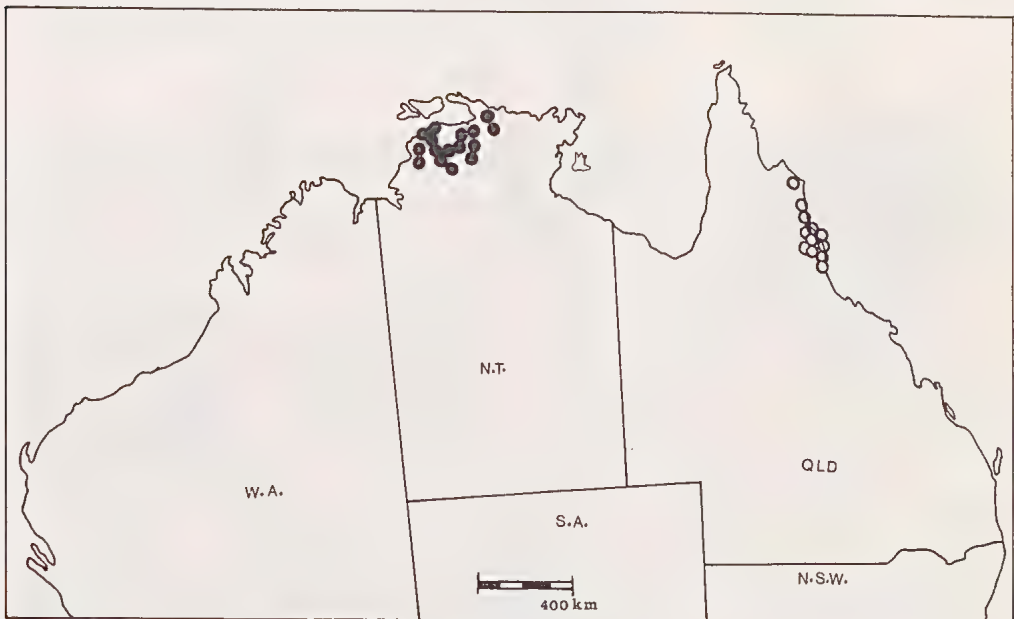
C. tatei is endemic to the north-north-west of Northern Territory. The main distribution is to the south and east of Darwin between latitude 12° and 14°S, and between longitude 130° and 134°E. The majority of localities are inside Kakadu National Park in the western part of Arnhem Land. Moldenke (1959, 1971, 1980) recorded this species from Zimbabwe in Africa, but so far its occurrence anywhere outside Australia has not been confirmed.

Found on "sandy" or "lateritic soil", rarely on "gravelly loam" and usually associated with "woodlands" or seldom in "savannah".

Comments

The leaves in *C. tatei* are highly variable in shape, ranging from orbicular-cordate to linear-lanceolate with margins entire, denticulate or deeply toothed. Similarly, fairly lax and long peduncled inflorescence or congested and short peduncled ones have been observed in different collections of the species. Such variations in the leaf-form and inflorescence may have influenced Mueller who in 1882 first described this taxon as *Strobilanthes tatei* in the Acanthaceae and later in 1891 as *Clerodendrum holtzei* in the Verbenaceae. After examining the types of both taxa, they are found to belong to the same *Clerodendrum* species and combination *C. tatei* was made.

In the protologue of *S. tatei* F. Muell., the corolla is described as "purple" and anther-cell "scantly hairy". Similarly, in the protologue of *C. holtzei* the style is noted as "almost totally enclosed" inside the corolla-tube. During present investigations, however, the corolla was found to be always white, anther-cells glabrous and style much exserted above the corolla-tube.



Map 10. Distribution of *C. tatei* ●, *C. tracyanum* ○.

In the typification of *Strobilanthes tatei*, R. Barker (1986) regarded the isolectotype in AD as "p.p." because the type material collected by R. Tate s.n., was "mixed with another species of similar habit vegetatively" collected by Foelsche 14. She also noted that Foelsche 14, "although resembling it vegetatively, has five stamens (or four stamens plus a staminode) not four". During present studies, Foelsche 14 has now been separated from the type material collected by R. Tate s.n. and the isolectotype in AD is no more "p.p.". Secondly, Foelsche 14 does not belong to a different species, and the fifth stamen or staminode observed in this collection by R. Barker (1986) is in fact the part of style and the actual stamen number is four.

Affinities

Amongst Australian *Clerodendrum*, *C. tatei* seems nearest to *C. parvulum* in its leaves being sessile or with minute petioles of 1-3 mm long, calyx pubescent outside and corolla-tube villous inside. Nevertheless, *C. tatei* may readily be identified by its habit being a prostrate, decumbent or suberect herb or subshrub; leaves variable in shape, ranging from cordate, rhomboid-orbicular to oblong-lanceolate with entire or toothed margins; stamens and style white. On the contrary, *C. parvulum* is an erect shrub with leaves obovate-oblong, elliptic-oblong to linear-lanceolate with entire margins, and stamens and style purple. Moreover, *C. parvulum* is endemic to Cape York Peninsula in Queensland, while *C. tatei* is endemic to north-north-west of Northern Territory.

There are several characters in common between *C. tatei*, *C. tomentosum* (Vent.) R. Br. and *C. tracyanum* (F. Muell.) Benth. In all these species, the leaves are pubescent-tomentose or hirsute and calyx pubescent outside. However, *C. tatei* differs by its prostrate-decumbent habit, sessile or almost sessile and of various shaped entire or dentate leaves and non-glandular villous hairs inside the corolla-tube.

6. *Clerodendrum parvulum* L.S. Smith, Contrib. Qld Herb. No. 6 (1969) 19; Mold., Fifth Summary Verbenac. etc. 1 (1971) 345; Sixth Summary Verbenac. etc. (1980) 335.

Type: L. Pedley 2647, 35 miles E of Musgrave Telegraph Office, Queensland, Australia, 17.vi.1968 (BRI, holotype).

Description (Fig. 8)

A shrub or subshrub, 24-75 (-100) cm tall. *Stem* erect, branched or single-stemmed, cylindrical, pubescent-hirsute, cineraceous, up to 5 mm diam. *Leaves* sessile, opposite, subopposite, scattered or ternate, approximate, single or apparently in clusters of 2-4 due to much reduced axillary branches; lamina narrowly obovate-oblong, elliptic-oblong, oblanceolate or linear-lanceolate, obtuse or subacute, cuneate, entire with slightly recurved margins, (5-) 10-25 (-30) mm long, (1.5-) 2-5 (-7) mm wide, pubescent-hirsute, more or less punctate all over. *Inflorescence* thyrse; cymes in axils of upper leaves, 1- or 3-flowered, lax; peduncle slender, pubescent, 10-25 mm long; bracteoles opposite, linear-lanceolate, pubescent, 1-3 mm long. *Flowers* pedicellate; pedicels pubescent, (2-) 3-8 (-10) mm long. *Calyx* campanulate, distinctly 5-lobed, 5-5.5 mm long, pubescent outside and on inner surface of lobes, glabrous inside tube; lobes deltoid, acute, 1.5-2 mm long, 1-1.5 mm wide at base; tube cylindrical, 3-3.5 mm long. *Corolla* white, sparsely pubescent outside, villous inside tube on level with insertion of stamens; lobes elliptic-oblong, rounded or obtuse at apex, ciliate along margins, 6-10 mm long, 4-6 mm wide; tube cylindrical, 7-10 mm long, c. 2 mm diam. *Stamens* purple, exserted; filaments inserted above middle of corolla-tube, mostly glabrous, villous near base only, filiform, 8-11 mm long; anthers elliptic-oblong, c. 2 mm long. *Ovary* glabrous, subglobose, faintly 4-lobed, c. 1.5 mm long; style purple, exserted, filiform, glabrous, 10-12 mm long, stigma shortly 2-lobed, lobes c. 1 mm long. *Fruit* obovoid-globose, glabrous, 5-7 mm long, \pm 5 mm diam.; fruiting calyx spreading to 10 mm diam.

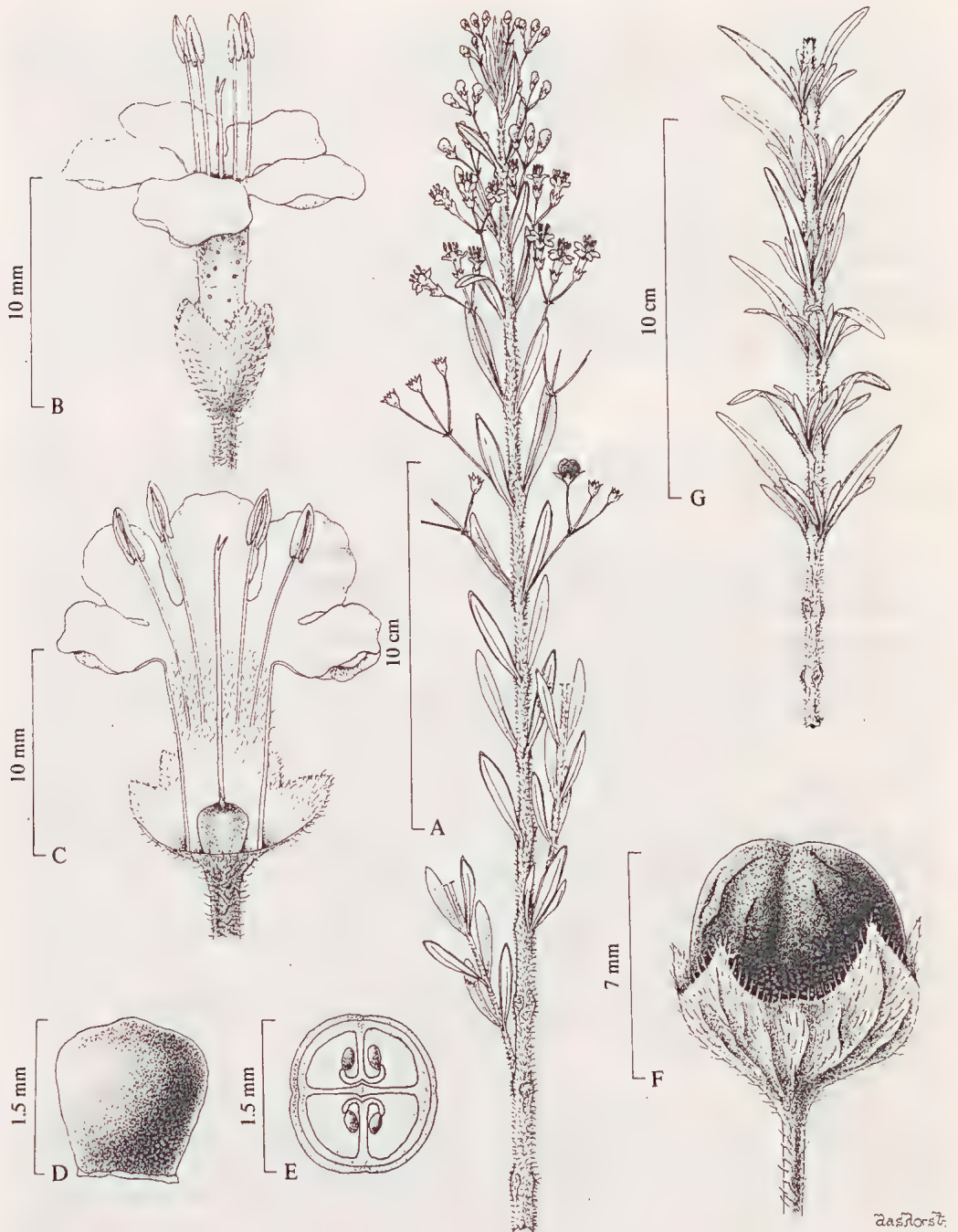


Fig. 8. *Clerodendrum parvulum* L.S. Smith (A-F, J.R. Clarkson 6994 & B.K. Simon s.n.: AD; G, L. Pedley 2647: BRI, holotype). A, flowering branch; B, flower showing external features; C, flower with calyx and corolla longitudinally cut open showing androecium, gynoecium and hairs inside corolla-tube; D, ovary; E, transverse section of ovary; F, fruit with persistent calyx; G, portion of a branch showing leaf-clusters at nodes.

Specimens examined

AUSTRALIA: QUEENSLAND: *Breeden s.n.*, near Musgrave Telegraph Office, c. 59.5 km SW of the southern most part of Princess Charlotte Bay, -v.1968 (BRI 266004, paratype); *Clarkson 4812*, 28.3 km N Kennedy River on Peninsula Development Road, 28.iv.1983 (AD, BRI, K, QRS); *Clarkson 6994*, Lakefield National park, Hann Crossing of the Kennedy River, 7.v.1987 (AD, BRI, L, MBA, QRS); *Gasteen 682*, Lakefield, -viii.1980 (BRI); *Hind 515*, 29.5 km S Musgrave, Peninsula Development Road, -ix.1974 (NSW); *Pedley 2647*, 56.3 km E Musgrave Telegraph Office, 17.vi.1968 (BRI, holotype).

Distribution and ecology (Map 3)

C. parvulum is endemic to Cape York Peninsula in northern Queensland where it has been recorded from between latitudes 14° and 16°S, and between longitudes 143° and 145°E. Almost all known localities are to the south and south-west of Princess Charlotte Bay where the major distribution seems to be in the area around Musgrave and inside the Lakefield National park.

Growing in "poorly drained sand" in *Melaleuca viridiflora* woodland or in grassy area on levee of rivers.

Comments

In the protologue, the length of the pedicel and peduncle of the single flowered cyme appear to have been combined. In the present study, therefore, the pedicel is considered to be the stalk of flower between calyx and the pair of small bracteoles below.

The type collections have no duplicate and comprise a single sheet each of holotype and paratype. According to collector's field notes "the plant was rare, and in both localities it was found growing on poorly drained sandy soil in open tea-tree (*Melaleuca* sp.) woodland".

In the protologue, the author of this species considered it to be closely allied to *C. tracyanum* and *C. holtzei* (now *C. tatei*) because, in his opinion, these two "are the only other Australian species with corolla-tube less than 1.5 cm long". According to the present investigation, however, the flowers of *C. heterophyllum* (Poir.) R. Br. are also smaller with a corolla-tube up to 1.5 cm long. Also, the opposite and ternate narrow leaves of this species are similar to that of *C. parvulum*. Among Australian *Clerodendrum*, therefore, the arrangement and shape of leaves of *C. parvulum* seems closer to that of *C. heterophyllum* than to *C. tracyanum* or *C. holtzei*. As for the length of corolla-tube, the corolla-tube in *C. holtzei* is 8-25 mm long and the shape and size of the leaf-lamina in *C. tracyanum* and *C. holtzei* are also different. Nevertheless, there are several other characters why *C. parvulum* is considered nearest to *C. tatei* and *C. tracyanum*. For detail see "Affinities".

Of the known Australian *Clerodendrum*, *C. parvulum* is the only species with sessile leaves. The proposed specific epithet *parvulum* for this species was presumably alluding to its comparatively smaller size.

S.L. Smith (1969) erroneously attributed the authorship of *C. holtzei* to Bleeser. As recorded here in the synonymy of *C. tatei*, *C. holtzei* was described by F. v. Mueller in 1891.

Affinities

C. parvulum is nearest to *C. tatei* in its leaves being pubescent-hirsute, sessile; calyx distinctly pubescent outside and corolla-tube villous inside. Nevertheless, *C. parvulum* can easily be identified by its leaves being obovate-oblong, elliptic-oblong to oblanceolate and entire; the inflorescence lax with cymes 1- or 3-flowered; the corolla-tube shorter, 7-10 mm long; stamens and style are purple.

There are several characters common between *C. parvulum* and *C. tracyanum* (F. Muell.) Benth. Both species have pubescence on the leaves, calyces and corollas, and with hairs inside the corolla-tubes. Nevertheless, *C. tracyanum* may easily be distinguished by being a tall shrub or a small tree of 2-12 m high; the stem 4-18 cm diameter at breast height; leaves with long petiole; leaf-blades cordate, very large measuring 6-34 x 4-25 cm; inflorescence never exceeding the upper leaves; flower small; corolla-tube 6-8 mm long; calyx- and corolla-tubes with gland-tipped hairs inside.

7. *Clerodendrum tracyanum* (F. Muell.) Benth., Fl. Aust. 5 (1870) 62; F. Muell., Syst. Cens. Aust. Pl. 1 (1882) 103; Bailey, Synop. Qld Fl. (1883) 380; F. Muell., Descr. Note Pap. Pl. 5 (1885) 91; Bailey, Rep. Gov. Sc. Exped. Bell.-Ker (1889) 52; F. Muell., Sec. Syst. Cens. Aust. Pl. 1 (1889) 173; Bailey, Cat. Indig. & Natur. Pl. Qld (1890) 36; Qld Woods (1888) 106; Qld Fl. 4 (1901) 1182; Compr. Cat. Qld Pl. (1913) 386; H.J. Lam, Verbenac. Malay. Archip. (1919) 274; Bakh. in H.J. Lam & Bakh., Bull. Jard. Bot. Ser. III, 3 (1921) 96; C. White & Francis, Proc. Roy. Soc. Qld 38 (1927) 259; Domin, Biblioth. Bot. 89 (1928) 557; Mold., Résumé Verbenac. etc. (1959) 201, 208, 339, 389; L.S. Smith, Contrib. Qld Herb. No. 6 (1969) 20; Mold., Fifth Summary Verbenac. etc. 1 & 2 (1971) 335, 338, 340, 345, 611, 729; Sixth Summary Verbenac. etc. (1980) 326, 328, 330, 335; Baines, Aust. Pl. Gen. (1981) 97; Elliot & Jones, Encyc. Austral. Pl. 3 (1984) 50.

Lectotype: *J. Dallachy s.n.* [101], Rockingham Bay, Queensland, Australia, 1 or 13.vi.1864 (K, lectotype designated here!; MEL 98353 — MEL 98360, MEL 98465, MEL 982953, MEL 982954 — isolectotypes!).

Premna tracyana F. Muell., Fragm. 5 (1865) 61, basionym.

Type: As for *Clerodendrum tracyanum* (F. Muell.) Benth.

Vitex tracyana F. Muell., Fragm. 5 (1865) 61, nom. invalid., pro syn. *Premna tracyana*.

Typification

C. tracyanum was originally described as *Premna tracyana* F. Muell., the type of which is based on J. Dallachy's (s.n.) collection from Rockingham Bay, Queensland. It consists of at least 12 duplicates of which one is preserved in Herb. K and the rest in Herb. MEL. Since the author of the basionym (F. Mueller) did not choose any one of them as a type, it is necessary to select a lectotype for this name. Out of all the syntypes, the one preserved in Herb. K is found annotated in F. Mueller's handwriting as "*Premna tracyana*". The specimen has both flowers and fruits, and seems to be the best representative of this species. It has been, therefore, selected here as the lectotype of this species.

Description (Fig. 9)

A tall shrub or small tree, 2-7 (-12) m high. *Stem* 4-18 cm diam. at breast height, with flaky-papery bark, young branches more or less velvety-pubescent or hirsute. *Leaves* broadly ovate, shortly acuminate, rounded or broadly cordate at base, entire, (6-) 10-30 (-34) cm long, (4-) 8-20 (-25) cm wide, chartaceous, more or less velvety-pubescent or hirsute; petiole velvety-pubescent, (2.5-) 5-15 (-20) cm long. *Inflorescence* a terminal trichotomous thyrse, dense at time of flowering (i.e. anthesis), velvety-pubescent or hirsute, 6-12 cm diam. when in fruit; bracts very small and deciduous; peduncle pubescent-hirsute, primary lateral branches (1-) 2-4 cm long. *Flowers* pedicellate; pedicels pubescent-hirsute, 3-6 (-11) mm long. *Calyx* turbinate-campanulate, divided to near middle into acute lobes, glandular and pubescent-hirsute outside, pubescent on inner surface of lobes, glandular with minute gland-tipped hairs inside tube, 5-7 mm long, enlarged and coloured in infructescence; lobes ovate-lanceolate or more or less deltoid, 1.5-3 mm long, 1.5-2.5 mm wide at base; tube 2.5-3 mm long. *Corolla* white, villous outside, glabrous inside excepting a few gland-tipped minute hairs in upper part of tube; lobes spreading, almost equal, ovate-elliptic, 4-6 mm long, (2.5-) 3-4 mm wide, glandular and villous on back (i.e. outside); tube cylindrical, 6-8 mm long, 1-2 mm in diam. *Stamens* exserted; filaments inserted above middle of corolla-tube, white, glabrous, filiform, 8-12 mm long; anthers oblong, 1.5-2 mm long, \pm 1 mm wide. *Ovary* globose, glabrous, 1-1.5 mm diam.; style exserted, white, glabrous, filiform, 10-18 mm long. *Fruit* globose-ovoid, glabrous, dark green to bluish-green, turning black when mature and dry, 4-6 mm long, 6-7 (-8.5) mm diam., enclosing 4 distinct 1-seeded pyrenes; fruiting calyx pink-red or deep red, enlarged, funnel-shaped, lobes recurved or spreading to 10 mm diam.

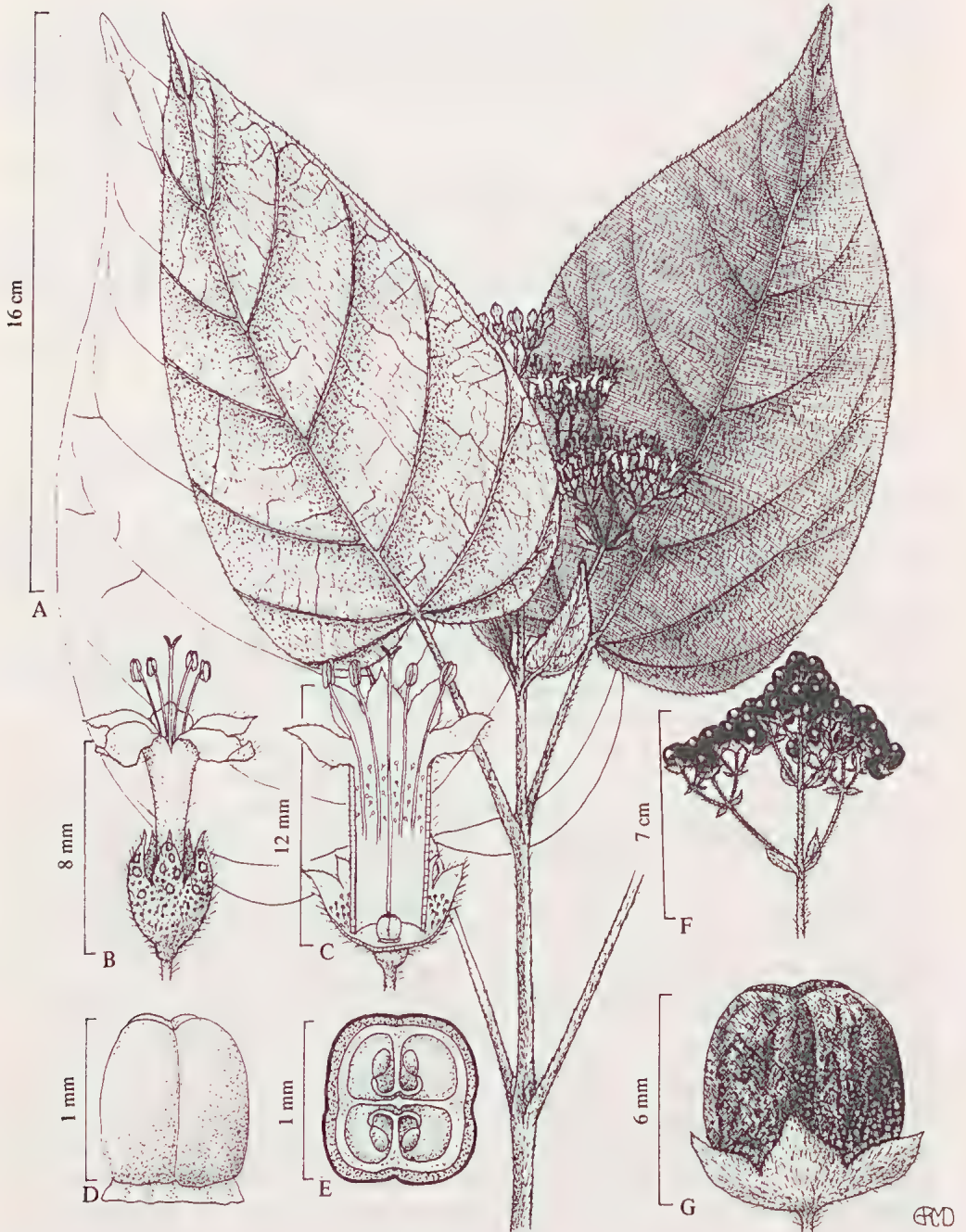


Fig. 9. *Clerodendrum tracyanum* (F. Muell.) Benth. (A-E, D.I. Nicholson 4759: QRS; F-G, B.P.M. Hyland 3606: L). A, flowering branch; B, flower showing hairs outside calyx and corolla; C, flower with calyx and corolla longitudinally cut open showing androecium and gynoecium; D, ovary; E, transverse section of ovary; F, inflorescence; G, fruit with persistent calyx.

Representative specimens (Collections seen: Australian 55, non-Australian 17)

AUSTRALIA: QUEENSLAND: *Bailey s.n.*, Harveys Creek, 1889 (BRI 265903 & -04); *Bailey s.n.*, Kamerunga, -vi.1892 (NSW 145089); *Berthoud s.n.*, Johnstone River, -xii.1882 (MEL 582841); *Brass 2045*, Mossman River, 4.ii.1932 (A, B, BRI); *Brass 2249*, Daintree River, 7.iii.1932 (A, B, BRI, K); *Brass 33519*, Whitfield Range, 23.ii.1967 (BRI, K, L, QRS); *Cabbage 3835*, foot of Bellenden-Ker, 14.viii.1913 (NSW, SYD); *Crome 466*, Lacey's Creek, Mission Beach, 6 km W Clump Point, 1.vi.1972 (CANB, L); *Dallachy s.n.*, Rockingham Bay, 1 or 13.vi.1864 (K, lectotype; MEL 98353 — MEL 98360, MEL 98465, MEL 582953, MEL 582954 — isolectotypes); *Dixon s.n.*, near Herberston, 1899 (NSW 145088); *Gray 2640*, State Forest Reserve 755, Barong L.A., 27.vi.1982 (AD, QRS); *Helms 1184*, Barron Falls near Cairns, 20.vi.1922 (C); *Hyland 3606*, S.F.R. 1073, c. 56 km NNE Atherton, -v.1966 (L, QRS, Z); *Hyland 1471*, S.F.R. 933, 9.iv.1968 (QRS); *Hyland 5256*, Cooroo Land, 15.vii.1971 (BRI, QRS); *Hyland 7330*, TR55, 2.vii.1974 (BRI, CANB, L, QRS); *Hyland 11723*, S.F.R. 933, 10.iii.1982 (AD, QRS); *Moriarty 2053*, S.F.R. 675, Little Mulgrave, c. 8 km WSW Gordonvale, 8.iv.1976 (BRI, L, QRS); *Nicholson 4759*, S.F.R. 675, Little Mulgrave Valley, 2.vi.1971 (AD, BRI, QRS); *Scarth-Johnson 168A*, Bloomfield, Gap Creek, undated (BRI); *Sparvell 5857*, Upper Mowbray, 22.iv.1939 (QRS); *Webb & Tracey 6660*, Miriwinni near Mt Bartle Frere, 1962 (BRI); *Webb & Tracey 8994*, end of Granite Creek Logging Road, Bloomfield River, W Ayton, 13.v.1969 (AD, BRI); *White 1540*, Kuranda, 28.ii.1922 (BRI, NSW); *Wrigley & Telford 1028*, Stewart Creek gorge, N Mossman, 11.vi.1972 (CBG).

PAPUA NEW GUINEA: *Carr 16464*, Kokodu, Papua, 23.iv.1936 (BM, CANB); *Gafui et al. BSIP 10280*, Torasina Ridge, Wairokai, SW Malaita, Solomon Islands, 15.vii.1968 (L); *Hoogland & Craven 10256*, near Ambunti, Sepik District, Territory of New Guinea, 9.vi.1966 (A, BRI, CANB, K, L, LAE, US); *Pullen 8219*, c. 15 km NE Cape Rodney, Central District, East Papua, 5.ix.1969 (CANB, L, LAE); *Stevens & Lelean LAE-58312*, lower slopes of Mt. Lululua, East New Britain, 6.v.1973 (A, BISH, BRI, CANB, E, K, L, M, NSW, US).

INDONESIA: IRIAN JAYA: *Kalkman BW6306*, Beriat, c. 12 km S Teminaboean, 27.iv.1958 (CANB, L, MAN); *Shram BW5996*, Tafelberg near Manokwari, 13.iii.1958 (BRI, L); *Versteegh BW4682*, between Sorong and Klamono, 5.xi.1956 (CANB, L, MAN).

Distribution and ecology (Map 10)

In Australia, *C. tracyanum* is known to occur in north-eastern Queensland where it has been reported from the coastal areas between Cooktown and Rockingham Bay. Within this range, it has been most commonly recorded on Atherton Tableland, chiefly in the south and south-west of Cairns. Moldenke (1959, 1971, 1980) recorded this species from Northern Territory, but so far its occurrence there has not been confirmed.

Collections from outside Australia have been examined from Papua New Guinea, Solomon Islands and Irian Jaya (Netherlands New Guinea).

Growing often on rocky substrate in rainforest or "complex mesophyll vineforest". Occasional on alluvial soil or edge of rainforest.

Comments

Bentham (1870) described the calyx as being "glabrous inside" and a similar view was expressed by Bailey (1883, 1901) and H.J. Lam (1919). After critical examination, however, the calyx is found pubescent inside with simple hairs on the lobes and gland-tipped short hairs inside the tube.

According to H.J. Lam (1919), *C. tracyanum* and *C. buruanum* Miq. are so close to each other that he could not find any difference between the two. In his key to the species, twice the same combination of characters are shown to lead simultaneously to the identification of both the species. During present investigation, the types as well as a range of material of both the species have been examined. As a result, *C. buruanum* Miq. is found to be fairly close to *C. tracyanum*, but differs in its leaves and inflorescence being much more densely hirsutulentose, calyx glabrous inside, corolla more densely pubescent-tomentose outside, inflorescence larger, drupe and fruiting calyx almost double the size of *C. tracyanum*.

H.J. Lam (1919) recorded the drupe as "0.7-1 cm in diam." for *C. tracyanum*, but this is larger than that generally found in the Australian specimens of the species. It is likely, that Lam confused the fruit of the two species which are very similar in shape.

The pedicels of the terminal flowers are often at least twice the length of the laterals.

The species is cultivated in Botanic Garden at Edge Hill, Cairns, northern Queensland.

Affinities

C. tracyanum approaches closely to *C. buruanum* Miq. in overall appearance of its leaves, inflorescence, flowers, fruit and the presence of indumentum. However, *C. tracyanum* may easily be identified by its leaves and inflorescence being less densely hairy; inflorescence somewhat smaller; calyx pubescent on the inner surface of the lobes and with short gland-tipped hairs inside the tube; corolla pubescent outside and with short gland-tipped hairs inside the tube; drupe and fruiting calyx almost half the size of *C. buruanum*.

Amongst the Australian *Clerodendrum*, *C. tracyanum* seems similar to *C. costatum* R. Br. in its leaves being pubescent-tomentose; petioles, pedicels, peduncles and outside calyx pubescent; stamens and style exerted; ovary and fruit (drupe) globose and glabrous. Nevertheless, *C. tracyanum* may readily be distinguished by its leaves being cordate; inflorescence congested, much shorter than the terminal leaves; primary lateral peduncles up to 40 mm long; calyx 4-7 mm long; corolla villous outside, the tube 6-8 mm long with gland-tipped short hairs inside; filaments 8-12 mm long; style 10-18 mm long and fruiting calyx spreading to 10 mm diameter. In *C. costatum*, the inflorescence is lax, much longer than the terminal leaves, the primary lateral peduncles are up to 80 mm long, calyx 8-12 mm long, corolla glabrous all over with tube 45-70 mm long, filaments 33-40 mm long, style 60-100 mm long and fruiting calyx spreading to 25 mm diam.

There are a few characters common between *C. tracyanum* and *C. parvulum*. For similarities and differences see "affinities" under *C. parvulum*.

8. *Clerodendrum tomentosum* (Vent.) R. Br., Prodr. Fl. Nov. Holl. (1810)510.

Type: G, no specimens seen; here based on Ventenat's (1804) plate 84 from cultivated material without definite locality.

Volkameria tomentosa Vent., Jard. Malm. (1804) t. 84, *basionym*; Pers., Synop. Pl. 2 (1807) 145.

Type: As for above.

Description

A tall shrub or a small tree, (1-) 2-7 (-10) m high. *Stem* "with a finely and regularly longitudinally fissured bark", branchlets pubescent-tomentose. Leaves petiolate; lamina variable, ovate, elliptic, oblong-elliptic or lanceolate, rounded, cuneate-attenuate, entire, shortly acuminate or acute, (4-) 6-13 (-16) cm long, (1.5-) 2.5-6 (-7.5) cm wide, thinly pubescent-tomentose to velvety-tomentose all over, sometimes almost glabrescent above; petiole pubescent-tomentose (10-) 15-30 (-40) mm long. *Inflorescence* a terminal corymbose thyrs; cymes compact, sometimes in the axils of upper leaves; peduncles pubescent-tomentose, primary lateral branches (5-) 10-20 (-25) mm long. *Flowers* pedicellate, congested; pedicels tomentose, 5-12 mm long. *Calyx* campanulate, pubescent-tomentose outside, glandular and pubescent-tomentose on inner surface, divided to about middle into acute or often obtuse lobes, 6-9 mm long; lobes 3-4 mm long, (1.5-) 2-3 mm wide at base; tube (2-) 3-4 mm long. *Corolla* white- or cream-coloured, pubescent or villous-tomentose outside, rarely glabrescent, always glabrous inside tube; tube cylindrical, 18-25 (-27) mm long, 2-3 mm diam.; lobes elliptic-oblong, rounded or obtuse at apex, (4-) 6-8 mm long, 2.5-4 mm wide. *Stamens* much exerted, protruding \pm 12-25 mm above corolla-tube; filaments inserted about $\frac{2}{3}$ above base of corolla-tube, white, glabrous, filiform, (15-) 20-30 (-37) mm long; anthers oblong, 2-2.5 mm long. *Ovary* glabrous, obovoid-globose, faintly or distinctly 4-lobed, 1.5-2.5 mm diam.; style

exserted, white, filiform, glabrous, 30-43 mm long. *Fruit* globose-obovoid, blue-black, purple or dark-purple, shiny, 5-15 mm long, 4-12 mm diam.; fruiting calyx funnel-shaped, 15-20 (-25) mm diam., bright- or dark-red.

Distribution

A native to Australia and Papua New Guinea. Distribution in Australia is restricted chiefly to the tropical parts of Western Australia, Northern Territory, Queensland and New South Wales. In New South Wales, this species provides the most southerly records of the genus in Australia.

Affinities

Amongst Australian *Clerodendrum* species, *C. tomentosum* is similar to *C. grayi* Munir in that its stem, leaves and inflorescence are pubescent-tomentose; leaf-blades oblong to elliptic-oblong; inflorescence exceeding the upper leaves; calyx- and corolla-tubes glabrous inside. Nevertheless, *C. tomentosum* may readily be identified by its foliage and inflorescence usually being velvety-pubescent; leaf-blades often cuneate-attenuate towards the base; inflorescence of somewhat compact cymes; calyx-lobes shorter, 3-4 mm long, pubescent on the inner surface as well; corolla-tube pubescent on the outside, shorter, 18-25 (-27) mm long; style shorter, 30-43 mm long. In *C. grayi*, the foliage and inflorescence are pubescent; leaf-blades rounded at the base; inflorescence of somewhat lax cymes; calyx-lobes 5-9 mm long, glabrous on the inner surface; corolla-tube glabrous and sparsely glandular on the outside, 25-40 mm long and style 60-75 mm long.

There are a few characters in common between *C. tomentosum* and *C. costatum* R. Br. In both species, the leaves are pubescent-tomentose at least on the abaxial surface; calyx pubescent outside, glandular on the inner surface of the lobes; stamens, style, ovary and inside of corolla-tube glabrous. However, *C. tomentosum* may easily be distinguished by its leaf-blades being pubescent-tomentose on both surfaces; inflorescence dense, composed of somewhat compact cymes; calyx-lobes pubescent inside; corolla-tube pubescent outside, less than half the length of *C. costatum* i.e. 18-25 (-27) mm long. In *C. costatum*, the leaf-blades are glabrous adaxially; corolla-tube glabrous all over, 45-70 mm long and style 60-100 mm long.

C. tomentosum has some characters in common with *C. floribundum* var. *attenuatum*. In both taxa, the petioles, peduncles and pedicels are pubescent; leaf-blades cuneate and inflorescence dense and pubescent-tomentose. For distinguishing characters see "affinities" under *C. floribundum* var. *attenuatum*.

8a. var. *tomentosum*.

C. tomentosum (Vent.) R. Br., Prodr. Fl. Nov. Holl. (1810) 510; Andr., Bot. Repos. 9 (1812) t. 607; Sims, Curtis's Bot. Mag. 37 (1813) t. 1518; Sprengel, Syst. Veg. 2 (1825) 759; Walp., Rep. Bot. Syst. 4 (1845) 106; Schauer in A. DC., Prodr. 11 (1847) 662; F. Muell., Fragm. 6 (1868) 152; Benth., Fl. Aust. 5 (1870) 62; F. Muell., Syst. Cens. Aust. Pl. 1 (1882) 103; Bailey, Synop. Qld Fl. (1883) 381; Proc. Roy. Soc. Qld 1 (1884) 71; Nilson, Timber Trees N.S.W. (1884) 44; Bailey, Qld Wood (1888) 92; Maiden, Usef. Nat. Pl. Aust. (1889) 406; F. Muell., Sec. Syst. Cens. Aust. Pl. 1 (1889) 173; Bailey, Cat. Pl. Qld (1890) 36; Moore, Handb. Fl. N.S.W. (1893) 357; Tepper, Bot. Centralbl. 54 (1893) 260; A.G. Ham., Proc. Linn. Soc. N.S.W. 9 (1894) 15, t. 2, fig. 1-2; Bailey, Qld Fl. 4 (1901) 1183; Dixon, Pl. N.S.W. (1906) 236; Bailey, Compr. Cat. Qld Pl. (1913) 386; Maiden & Betche, Cens. N.S.W. Pl. (1916) 178; W. Fitzg., J. & Proc. Roy. Soc. Western Australia 3 (1918) 201; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenzorg Ser. III, 3 (1921) 96; Domin, Biblioth. Bot. 89 (1928) 558; Bakh., J. Arn. Arb. 10 (1929) 72, 264; C. Gardner, Enum. Pl. Aust. Occ. 3 (1931) 112; Anderson, Trees N.S.W. (1947) 272; Webb, C.S.I.R. Bull. No. 232, (1948) 168; Francis, Aust. Rainforest Trees (1951) 367; Mold., Résumé Verbenac. etc. (1959) 201, 208, 217, 264, 270, 393; Beard, W. Aust. Pl. 2nd edn (1970) 113; Mold., Fifth Summary Verbenac. etc. 1 & 2 (1971) 335, 345, 360, 447, 466, 734; Beadle et al., Fl. Syd. Region (1972) 508; Rotherham et al., Flow. Pl. N.S.W. & S. Qld (1975) 100, t. 308; Mold., Sixth Summary Verbenac. etc. (1980) 326, 335, 351, 461; Baines, Aust. Pl. Gen. (1981) 97; J. Green, Cens. Vasc. Pl. W. Aust. (1981) 89; Jacobs & Pickard, Pl. N.S.W. (1981) 209; Munir in Jessop (ed.), Fl. Cent. Aust. (1981) 296; Beadle, Student's Fl. NE N.S.W. 4 (1984) 858; Elliot & Jones, Encyc. Aust. Pl. 3 (1984) 50; Stanley in Stanley & Ross, Fl. SE Qld 2 (1986) 370; D. Jones, Ornament. Rainforest Pl. Aust. (1986) 207; Dunlop, Vasc. Pl. North.-Terr. (1987) 79.

Type: As for *Clerodendrum tomentosum* (Vent.) R. Br.



Fig. 10. *Clerodendrum tomentosum* (Vent.) R. Br. var. *tomentosum* (A-E, A. Morrison 5104; K; F, C. Burgess s.n.: CBG009494). A, flowering branch; B, undissected flower; C, flower with calyx and corolla longitudinally cut open showing androecium and gynoecium; D, ovary; E, transverse section of ovary; F, fruit with persistent enlarged calyx.

C. medium R. Br., Prodr. Fl. Nov. Holl. (1810) 510; Sprengel, Syst. Veg. 2 (1825) 759; Walp., Rep. Bot. Syst. 4 (1845) 105.

Type: *R. Brown s.n., J.J. Bennett no. 2312*, Keppel Bay, Qld, 1802-1805 (BM!, syntype); *R. Brown s.n., J.J. Bennett no. 2313*, Thirsty Sound, Qld, 1802-1805 (BM!, K! — syntypes).

C. hügelii Regel, Gartenflora 10 (1861) 51.

Type: *Baron von Hügel s.n.*, introduced by Baron von Hügel from New Holland (i.e. Australia) and cultivated at the Royal Botanic Gardens St. Petersburg, undated (LE!).

C. floribundum R. Br. var. *medium* (R. Br.) Mold., Phytologia 39 (1978) 236.

Type: As for *C. medium* R. Br., Prodr. Fl. Nov. Holl. (1810) 511.

C. ovatum R. Br., Prodr. Fl. Nov. Holl. (1810) 511, p.p. quoad descr. "B. folia calycesque pubescentes" and syntype *R. Br. s.n., J.J. Bennett no. 2315*, Carpentaria Island, Northern Territory, 1902-1905 (BM!, El, K!).

Diagnosis (Fig. 10)

Of all infraspecific taxa of the species, var. *tomentosum* is distinguished by its leaf-blades being elliptic, elliptic-oblong or broadly lanceolate, attenuate towards the base, thinly pubescent-tomentose or almost glabrescent above, tomentose underneath; the inflorescence congested, tomentose; the calyx softly pubescent on the outside, glandular and puberulous inside; the corolla-tube pubescent or sometimes glabrescent outside; the fruit slightly larger than the other varieties, mostly 8-15 x 5-12 mm.

Representative specimens (Collections seen: Australian 274, non-Australian 3)

AUSTRALIA: WESTERN AUSTRALIA: *Barnett s.n.*, Kimberley, 1938 (PERTH); *Beard 4027*, 16-80 km NE Callawa Stn, 7.v.1965 (King's Park Perth, L, NSW, PERTH); *Beard 4061*, between Radi Hills and Wallal Downs, 9.v.1965 (Kings's Park Perth, PERTH); *Copley 1201*, Mt Davis, E Carnarvon Ranges, 19.vii.1985 (AD); *George 5482*, 43.5 km W Mt Nossiter, 20.vii.1963 (B, PERTH); *Harrington 1*, Anna Plains, 5.v.1967 (King's Park Perth); *Perry 2392*, c. 42 km N Nicholson Stn., 7.vii.1949 (BRI, CANB, NT); *Royce 7439*, Rosemary Island, Dampier Archipelago, 16.vi.1962 (PERTH); *Taylor 36*, Cable Beach, Broome, 24.v.1971 (CANB, K, NT).

NORTHERN TERRITORY: *Forrest s.n.*, Port Darwin, 1879 (MEL 98438 & MEL 98439); *Craven 3702*, Sir Edward Pellow Group of Islands, Gulf of Carpentaria, 8.ii.1976 (CANB, NT).

QUEENSLAND: *Bailey s.n.*, Brisbane River, undated (BRI 266135); *Bancroft s.n.*, Samford, undated (BRI 266128); *Batianoff & McDonald 135*, Livingstone Shire, Coconut Pt., 4 km S Emu Park, 12.vii.1977 (BRI); *Batianoff & McDonald 359*, 7.5 km N Yeppoon, 18.vii.1977 (BRI); *Blake 8802*, Mount Isa, 28.iv.1935 (BRI); *Dietrich 973*, Rockhampton, -vi.1865 (MEL, PR); *Dunn s.n.*, Acacia Creek via Killarney, -xi.1905 (NSW 145115); *Everist 3268*, Armore, c. 40 km W Dajarra, 24.xi.1947 (BRI); *Farrell 696*, 2 km N Smelter Stack, 20.xii.1976 (BRI); *Gittins 1131*, Dundowran, -ix.1965 (BRI, NSW); *Hyland 6058*, Barrabas Scrub, 16.v.1972 (BRI, L, QRS); *Johnson 1801*, c. 21 km S Collinsville, 24.v.1960 (BRI); *Kenny & White 1026*, Crows Nest, -x.1921 (BRI); *Longman s.n.*, Toowoomba, -ix.1931 (K); *Moriarty 1450 & 1453*, Almaden-Chillagoe Rd, c. 5 km from Chillagoe, 24.viii.1973 (BRI, CANB, E); *F. Mueller s.n.*, Burnett River, undated (MEL 98179); *F. Mueller s.n.*, Port Denison, undated (MEL 98326); *Perry 1434*, 48.28 km SE Riversleigh Station, 11.vi.1949 (BRI); *Sellwood s.n.*, Biddaddaba, 1.vii.1965 (BRI 061280); *Shirley s.n.*, Mt Mistake, undated (BRI 266138); *Simmonds s.n.*, Milton, 17.xi.1888 (BRI); *Stanley s.n.*, Cania Gorge, c. 30 km NW Monto, 3.xi.1976 (BRI 219548); *Stocker 1064*, Rocky River area, 11.ix.1973 (BRI, CANB, L, QRS); *Weatherhead s.n.*, Benarkin, undated (BRI 266131); *Webb 657*, Mungana Caves area, 17.vi.1945 (CANB, JCT); *Webb & Tracey 7274*, W Mt Garnet, 1962 (BRI); *Webb & Tracey 7399*, Davies Creek, Lamb Range between Mareeba and Kuranda, 1962 (BRI); *Webb & Tracey 10162*, Black Rock, c. 26 km S Lynd Junction on Hann Highway between Hughenden and Mt Garnet, 19.v.1970 (BRI).

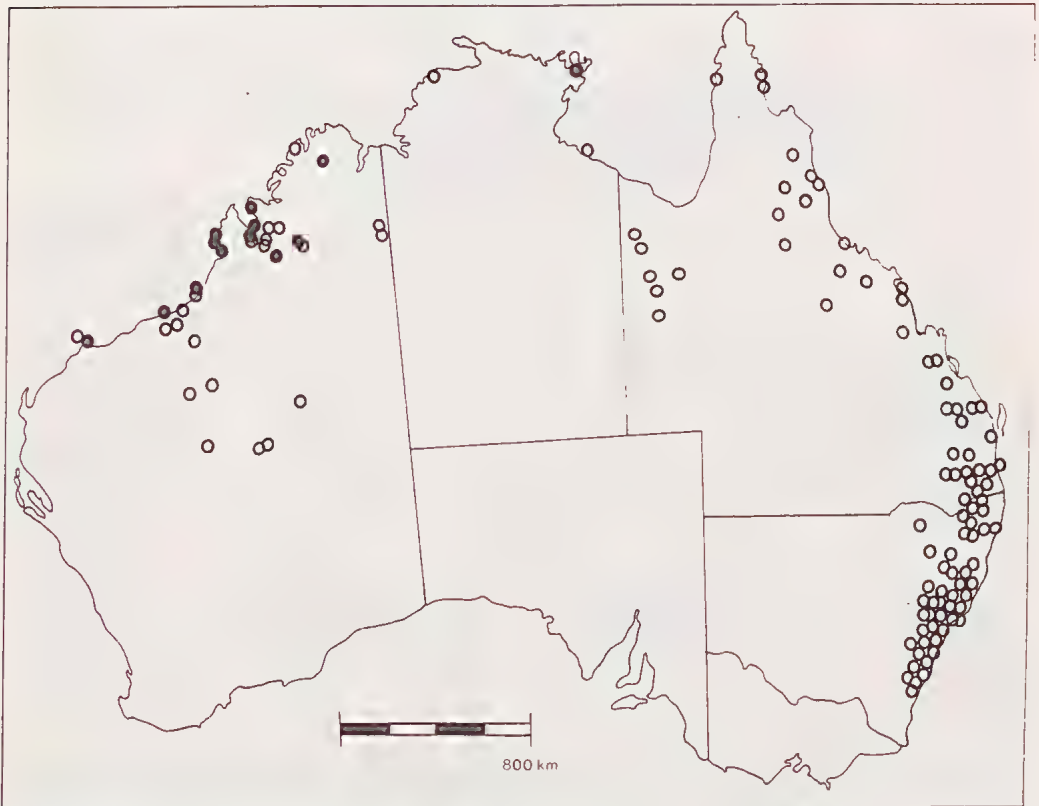
NEW SOUTH WALES: *Alkin s.n.*, Bulli Mount, 9.i.1880 (Z); *Bäuerlen 336*, Lower Shoalhaven, -i.1884 (MEL); *Bauer s.n.*, Port Jackson, undated (W 2 spec.); *Betche 78*, Manning River, -ii.1882 (MEL); *Blakely s.n.*, Hornsby, -vi.1917 (NSW 145106); *Blaxell 258*, *Pickard & Hayes*, Pikapene State Forest, SW Casino, 20.iv.1969 (NSW); *Boorman s.n.*, Paterson River, -viii.1906 (NSW 145126); *R. Brown s.n., J.J. Bennett no. 2310*, Port Jackson, 1802-1805 (BM, E, K); *Burbidge 2873*, S Camden, 11.x.1948 (CANB); *Burgess s.n.*, Silverdale, 7.vii.1962 (CBG 012579); *Chadwick 1376*, Wollongong district, 19.iii.1946 (NSW); *Chapman s.n.*, Mosman, 25.xi.1906 (SYD); *Constable 24027*, Kempsey-Bellbrook Road, 20.i.1953 (NSW); *Constable 5898*, Kanangra, 16 km SE Jenolan Caves, 23.v.1965 (NSW); *Crawford 361*, Moona Plains, Walcha, -xii.1884 (MEL); *Dunlop 152*, Little Forest, 8 km from Milton, 1.x.1968 (CBG, DNA); *Evans s.n.*, Eastwood, 10.i.1966 (NSW 145107); *Fraser & Vickery s.n.*, Clarencetown, 7.xi.1936 (L, NSW 145137); *Fraser & Vickery s.n.*, Coneac district, 3.ii.1937 (NSW 145138); *Gregson s.n.*, Barrington River, 2.ii.1898 (NSW 145146); *Hitchcock 97*, Sandy Creek, 7 km E Aberdeen, 19.xi.1978 (NSW); *Johnson & Constable s.n.*, Caird's Gap, Liverpool Range, 31.x.1954 (NSW 145152); *Michael s.n.*, Cremorne Point,

1929 (NSW); *Morrison 5104*, Pymble, 14.5 km NW Sydney, 3.xi.1896 (K, MEL) NSW); *F. Mueller s.n.*, Clarence River, undated (MEL 98340); *Oxenford s.n.*, Nymboida, 18.xi.1957 (NSW); *Rodway s.n.*, Nowra to Berry, -.x.1917 (HO 23619, NSW 145102); *Rodway s.n.*, Brundee, Crookhaven River, -.ii.1921 (NSW 145201); *Salasoo s.n.*, Smith's Lake, S Forster, 5.i.1967 (NSW); *Schodde 5168*, Yellow Rock Creek, c. 6.4 km SW Albion Park, Central Coast, 13.xii.1966 (A, CANB, CHR, K, L, NSW); *Schwarz 61*, Ash Island, undated (W); Sieber 267, Port Jackson, 1823 (B, BR, G, L, LE, MEL, MO, W 4 spec.); *Streimann 8029*, Macquarie Pass, 28 km SW Wollongong, 12.viii.1972 (A, BISH, CBG, L); *Telford 2242*, Upper Allyn River, 24.xi.1970 (CBG); *Telford 2335*, Upper Macleay River, 26.xi.1970 (CBG); *Telford 2852*, O'Sullivan's Gap, 14.5 km N Bulahdelah, 15.ii.1971 (CBG); *Whaite 2129*, Maitland Bay, 30.i.1959 (NSW); *Willis s.n.*, Cambewarra Mt near Nowra, 22.iii.1954 (MEL 98352).

PAPUA NEW GUINEA: *Australian Forest Survey Co. NGF268*, Yalu Camp area, Morobe District, 7.vii.1944 (BRI, LAE); *Brass 1586*, Domera River, 31.v.1926 (BRI, LAE); *Garrett-Jones ANU 21125*, Lae subdistrict, Morobe Province, 30.iv.1976 (CANB).

Distribution and ecology (Map 11)

In Australia, *C. tomentosum* var. *tomentosum* is known to occur chiefly in the coastal regions of Western Australia, Northern Territory, Queensland and New South Wales. A few inland collections, however, have been made from Western Australia and Queensland. In Western Australia, the distribution is mainly in the north-western coastal areas between Dampier and Derby. It has also been recorded from southern Kimberley though its occurrence in northern Kimberley is highly likely. From the interior of that State, it has been collected along the north-western fringes of the Gibson Desert. Within Western Australia this taxon is known to occur below 26°S. Distribution in the Northern Territory has been reported from near Darwin, and from Sir Edward Pellow Group of Islands in the Gulf of Carpentaria.



Map 11. Distribution of *C. tomentosum* var. *tomentosum* ○, *C. tomentosum* var. *mollissima* ●.

In Queensland, the distribution is sparse in the northern half with frequency of records gradually increasing towards south. The northern-most distribution limit along the east coast is near Iron Range in the Cape York Peninsula, and the southern limits extend over the border into north-eastern New South Wales. On the Gulf side, it has been recorded from near Aurukun Mission. From the interior of the State, it is known to occur in the areas around Mt Isa and Cloncurry. The occurrence in New South Wales is fairly dense but restricted to the coastal areas between 28° and 36°S and between 150° and 154°E. Within this area, the taxon is known to occur throughout from the north-eastern tip of the State southwards to Ulladulla Township. It has not been recorded from the dryer interior parts of the State.

Collections from Papua New Guinea are the only ones examined from outside Australia. The occurrence of this taxon in Papua New Guinea was first recorded by R.C. Bakhuizen (1929) who also for the first time relegated *C. medium* to a synonym of *C. tomentosum*. Since then, this taxon has not been frequently recorded from that region. According to Moldenke (1959, 1971, 1980), this species has been cultivated in Australia, Belgium, Brazil, California in the U.S.A., France and Russia. Specimens from cultivation have been examined from the Waite Agricultural Research Institute Adelaide, Botanic Gardens Melbourne and Botanic Gardens Geneva in Switzerland.

Growing usually on coarse soils, often with limestone outcrops associated with forest, stunted rainforest or deciduous vine thicket. Also occurs among "boulders", beachside scrub and along river banks.

Comments

Of all the species of *Clerodendrum*, *C. tomentosum* has the southern-most distribution in Australia. It has been recorded as far south as the sources of Shoalhaven River in south-eastern New South Wales. In this State, this species is called by the common name "Lolly Bush", but in Curtis's Botanical Magazine 37 (1813) t. 1518, the popular name recorded for *C. tomentosum* is "Downy *Clerodendrum*, or Cumberland Tree". Due to velvety-pubescent foliage and inflorescence, this species has been called by some "Hairy *Clerodendrum*".

In Sims' (1813) view, "Ventenat's figure in the Jardin de Malmaison seems to have been taken from a weakly flowering plant. Mr. Brown has even expressed a doubt whether it be the same species, on account of there being others so nearly related, as not to be very easily distinguished".

According to Webb (1948), this species was "suspected on several occasions of poisoning stock in New South Wales". In Anderson's (1947) view, the timber of *C. tomentosum* var. *tomentosum* is soft, light in weight, and has no particular use.

Abnormal flower parts have been noticed in collections by *E. Gauba s.n.*, (CBG 002949) and *R. Schodde 5168* (CANB). In both collections, some flowers were found to be with calyx 4-6 (-7)-lobed, corolla 4-6-lobed and stamens 5.

8b. var. **lanceolatum** (F. Muell.) Munir, comb. & stat. nov.

Lectotype: *P. Walcott s.n.*, Nickol Bay, Western Australia, undated (MEL 98304, lectotype designated here!; K, MEL 98302, MEL 98303 — isolectotypes!).

C. lanceolatum F. Muell., Fragm. 3 (1863) 145, **basionym**; Benth., Fl. Aust. 5 (1870) 63; F. Muell., Syst. Cens. Aust. Pl. 1 (1882) 103; Sec. Syst. Cens. Aust. Pl. 1 (1889) 173; Bailey, Qld Fl. 4 (1901) 1183; Bailey, Compr. Cat. Qld Pl. (1913) 386, fig. 364; Domin, Biblioth. Bot. 89 (1928) 558; C. Gardner, Enum. Pl. Aust. Occ. 3 (1931) 112; Mold., Résumé Verbenac. etc. (1959) 427; Beard, W. Aust. Pl. edn 2 (1970) 113; Mold., Fifth Summary Verbenac. etc. 1 (1971) 345; Sixth Summary Verbenac. etc. (1980) 335; Baines, Aust. Pl. Gen. (1981) 97; Green, Cens. Vasc. Pl. W. Aust. (1981) 89; Elliot & Jones, Encyc. Aust. Pl. 3 (1984) 49.

Type: As for above.

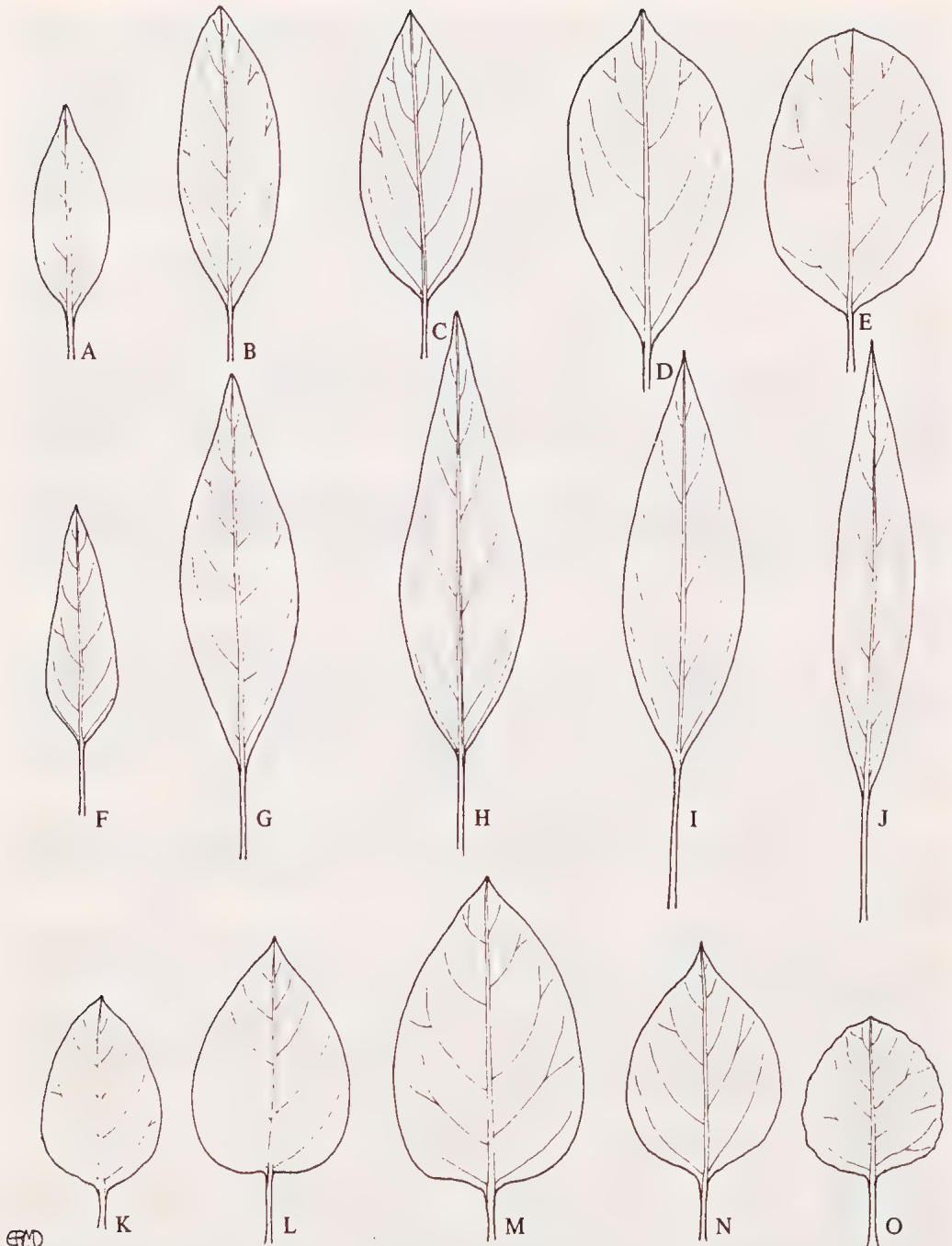


Fig. 11. Range of variation in leaf form of *Clerodendrum tomentosum* (Vent.) R. Br. (A-E, var. *tomentosum*; F-J, var. *lanceolatum* (F. Muell.) Munir; K-O, var. *mollissima* Benth.). A, R.D. Royce 1895: PERTH; B, E. Long s.n.: QRS039812; C, D.M. Harington 1: King's Park, Perth; D, W.T. Jones 3829: CANB; E, F. v. Mueller s.n.: MEL98420; F, A.R. Fairall 2088: King's Park, Perth; G, G.N. Batianoff 193 & T.J. McDonald s.n.: BRI; H, C.H. Gittins 1438: NSW; I, W.V. Fitzgerald 1223: PERTH; J, S.J. Forbes 2564: AD; K, U. Johnson 31: NSW; L, N.T. Burbidge 1371: PERTH; M, I.R. Telford 6407 & G. Butler s.n.: CBG; N, C.A. Gardner 7005: PERTH; O, C.A. Gardner 7013: PERTH.

Typification

C. tomentosum var. *lanceolatum* is based on Pemberton Walcott's (s.n.) collection from Western Australia consisting of at least 4 duplicates. Since the author of the basionym did not select any of them as a holotype, it is necessary to choose a type for this name. All syntypes were annotated by F. Mueller who apparently used them in preparing the original description of *C. lanceolatum*. Of these syntypes, MEL 98304 seems a better representative of this taxon and is, therefore, designated here as the lectotype.

Diagnosis (Fig. 11)

Amongst the infraspecific taxa of *C. tomentosum*, var. *lanceolatum* is distinguished by its leaf-blades being narrow-lanceolate, cuneate-attenuate towards both ends and pubescent-tomentose all over; the inflorescence less congested than in the typical form; the calyx pubescent-tomentose outside, glandular and pubescent-tomentose inside; the corolla-tube usually densely villous-tomentose outside, sometimes glabrescent in specimens having very narrow and small glabrescent leaves; fruit a little smaller than the typical form, mostly 5-7 by 4-6 mm.

Representative specimens (Collections seen: Australian 35, non-Australian 0)

WESTERN AUSTRALIA: *Beard* 2842, 15 km N Marble Bar, 16.viii.1963 (King's Park Perth); *Beard* 3583, Cape Range, W Learmouth, 22.vii.1964 (King's Park Perth, PERTH); *Blockley* 867, Winjina Gorge, Napier Range, 6.viii.1968 (King's Park Perth); *Broadbent* 1957, Pyramid, SE Roebourne, 28.v.1954 (BM, CANB); *Fairall* 2088, 45 km from Carnegie to Mt Everard, 28.vii.1966 (King's Park Perth, PERTH); *Fitzgerald* 1478, Packhorse Range, -ix.1905 (NSW, PERTH); *Forbes* 2564, 9 km SSW Bungle Bungle, SE Kimberley, -vii.1984 (AD, MEL); *Forbes* 2594, between Njitparriya and Dilmariyu, SE Kimberley, 9.vii.1984 (AD, MEL); *Forrest* s.n., Jones Creek & George River, S Roebourne, 1878 (AD, MEL 98415); *Forrest* s.n., Sherlock River, 1878 (MEL 98306); *Gardner* 3049, banks of Ashburton River, 17.viii.1932 (PERTH); *George* 13426, Drysdale River National Park, 5.viii.1975 (PERTH); *Gittins* 1438, southern foot of Bold Bluff, Kimberley, -vii.1967 (NSW, PERTH 2 spec.); *Kenneally* 4400, Euro Gorge, 15°03'S, 126°44'E, 17.viii.1975 (CANB, PERTH); *King* s.n., between the Gascoyne & Fortescue Rivers, 1885 (MEL 98310); *Power* 852, Camballin, -v.1970 (PERTH); *Royce* 1939, N Cecilia Mount, 25.v.1947 (PERTH); *Stanley* s.n., Yandeyarra, -viii.1929 (PERTH); *Walcott* s.n., Nickol Bay, undated (MEL 98304, lectotype; K, MEL 98302, MEL 98303 — isolectotypes).

QUEENSLAND: *Batianoff & McDonald* 193, Coorooman Creek, 6 km S Emu Park, 13.vii.1977 (BRI); *Batianoff & McDonald* 670, Rosslyn Head National park, 7 km SE Yeppoon, 9.ix.1977 (BRI); *Moriarty* 1473, Almaden-Chillagoe Road, c. 9 km from Chillagoe, 24.viii.1973 (BRI, CANB); *Story & Yapp* 206, 14.48 km W Wilpeena Park Homestead, 23.vii.1962 (BRI, CANB, MEL); *Whitehead* s.n., Fletcher River, c. 64.37 km S Charters Towers, 6.xi.1920 (BRI).

Distribution and ecology (Map 4)

Var. *lanceolatum* is endemic to mainland Australia. It has been recorded from north-north-west of Western Australia and north-east of Queensland. In Western Australia, it has been found mainly in the Kimberley and in the coastal region between Eighty Mile Beach and Exmouth Gulf. The only inland locality is between Carnegie and Mt Everard to the south-west of Gibson Desert. Distribution in Queensland is limited to a few localities. Here it is known to occur in the north-east of Rockhampton, south of Charters Waters and near Chillagoe on Atherton Tableland. Further inland, one locality to the west of Rockhampton is near Wilpeena Park Homestead.

Growing mostly on sandy or rocky substrate, sometimes with limestone in "scrub" to "low woodland" vegetation and often associated with banks of creeks. In open heath scrub vegetation include mainly *Banksia*, *Casuarina* and *Eucalyptus* species.

Comments

According to Bentham (1870), *C. lanceolatum* "is not very definitely separated from *C. tomentosum*". The present investigations agree and, therefore, *C. lanceolatum* is relegated to the

rank of a variety under *C. tomentosum*. The former differs from *C. tomentosum* only by its narrow lanceolate leaves, somewhat lax inflorescence, more dense pubescent tomentum on the inner surface of calyx, dense villous-tomentum outside corolla-tube and somewhat smaller sized fruit. Sometimes, however, it is difficult to place intermediate forms of *C. lanceolatum* and *C. tomentosum*. Generally, the very narrow and small leaved collections tend to have glabrescent leaf-blade, calyx and corolla-tube.

Moldenke (1959) recorded this taxon as endemic in Northern Territory. Subsequently, in 1971, he expanded its distribution to Western Australia and Queensland. According to present studies, however, the occurrence of this taxon in the Northern Territory has not been confirmed.

Affinities

Amongst the infraspecific taxa of *C. tomentosum*, var. *lanceolatum* is nearest to the typical variety by its leaf-blades being much longer than wide, cuneate-attenuate towards the base, tomentose all over or pubescent-glabrescent above and corolla-tube villous-tomentose or sometimes glabrescent outside. For distinguishing characters, see "Key to the species and infraspecific taxa".

There are a few characters in common between var. *lanceolatum* and *C. floribundum* var. *angustifolium* (see "Affinities" under the latter taxon).

8c. var. *mollissima* Benth., Fl. Aust. 5 (1870) 63; Bailey, Qld Fl. 4 (1901) 1183; Bailey, Compr. Cat. Qld Pl. (1913) 386; Ewart & Davies, Fl. N. Territory (1917) 238; Mold., Fifth Summary Verbenac. etc. 1 (1971) 345, 457; Sixth Summary Verbenac. etc. (1980) 335.

Lectotype: Dr. Martin 44, Roebuck Bay, Western Australia, undated (MEL 98342, lectotype designated here!); *B. Gull s.n.*, Caledon Bay, N.T., 2.x.1867 (MEL 98346, syntype!).

C. ovatum R. Br., Prodr. Fl. Nov. Holl. (1810) 511, p.p. quoad descr. "B. folia calycesque pubescentes"; Sprengel, Syst. Veg. 2 (1825) 758, p.p.; Walp., Rep. Bot. Syst. 4 (1845) 105, p.p. quoad descr. "B. folia calycesque pubescentes"; Schauer in A. DC., Prodr. 11 (1847) 671, p.p. quoad descr. "B. folia calycesque pubescentes".

Type: R. Brown s.n. J.J. Bennett no. 2315, Allen Island, Gulf of Carpentaria, Queensland, 1802 (BM, E, K, W — syntypes!).

Typification

C. tomentosum var. *mollissima* is based on two collections, one by Dr. Martin from Roebuck Bay, Western Australia, and another by B. Gull from Caledon Bay, Northern Territory. Since the author did not designate a holotype for this taxon, a lectotype was chosen. Of the two syntypes, Dr. Martin's collection from Roebuck Bay seems to be a better representative of this variety. It has been selected here as the lectotype for this taxon.

Diagnosis (Fig. 11)

Var. *mollissima* differs from the typical variety by its leaf-blades being broadly ovate, rounded at the base, densely velvety-tomentose all over; the inflorescence more congested, densely villous-tomentose, usually more so than the typical form; the corolla-tube always villous-tomentose outside, and never glabrous.

Representative specimens (Collections seen: Australian 22, non-Australian 0)

WESTERN AUSTRALIA: *Briggs 3673*, Geikie Gorge, 16 km NE of Fitzroy Crossing, 17.vi.1970 (NSW); *Broadbent 792*, between Wallal and De Grey, 31.v.1953 (BM); *Broadbent 821*, Noonkanbah, 9.vi.1953 (BM); *Burbidge 1297*, Kalgi Station, 80-mile Beach, 1.vii.1941 (PERTH); *Burbidge 1371 & 1482*, Anna Plains Stn., 80-mile Beach, 9.vii.1941 (PERTH 2 spec.); *Davis s.n.*, between Lanji Bridge and Neilibublica Well, 29.vi.1943 (NSW 145122); *Forrest s.n.*, Fitzroy River, 1883 (MEL 98379, MEL 98380); *Froggat s.n.*, King Sound, 1888 (MEL 98364);

Gardner 7005, Broome, 28.iv.1944 (PERTH); *George 13853*, Drysdale River National Park, 15.viii.1975 (CANB, PERTH); *Johnstone s.n.*, between Nickol Bay and Kimberley River, 1887 (MEL 98416); *Kenneally 6861*, Poinciana Well, Dampierland, 16 km N Broome, 15.ix.1978 (PERTH); *Martin 44*, Roebuck Bay, undated (MEL 98342, lectotype); *Telford 6407 & Butler s.n.*, Kimbolton Homestead, c. 70 km NNE Derby, 2.viii.1977 (CBG); *Tepper 16*, Roebuck Bay, -viii.1889 (MEL 98128); *Wittwer 2300*, Kimbolton Homestead, 2.vii.1980 (King's Park Perth).

NORTHERN TERRITORY: *B. Gull s.n.*, near Caledon Bay, Arnhem Land, 2.x.1867 (MEL 98346, syntype).

Distribution and ecology (Map 11)

Var. *mollissima* is known to occur chiefly in the north-north-west of Western Australia with only one record from near Caledon Bay in Northern Territory. The distribution in Western Australia is along the North West Coastal Highway, Northern Highway and in the northern and western Kimberley region. Distribution along the Highways has been recorded from between Broome and Dampier, chiefly near Eighty Mile Beach and Roebuck Bay. Collections from the Kimberleys have come from Drysdale River National Park, King Sound area and along Fitzroy River.

Growing usually on sandy soils and often found in "fragmented deciduous vine thickets" on coastal dunes ("hind dunes").

Affinity

Var. *mollissima* resembles the typical form by its inflorescence being compact and densely tomentose, and corolla-tube villous-tomentose outside. However, var. *mollissima* may be distinguished by its leaf-blades being very broadly ovate with an almost rounded base, densely velvety-tomentose all over, and corolla-tube always villous-tomentose outside, never glabrescent.

9. *Clerodendrum costatum* R. Br., Prodr. Fl. Nov. Holl. (1810) 511; Sprengel, Syst. Veg. 2 (1825) 759; Walp., Rep. Bot. Syst. 4 (1845) 105; Schauer in A. DC., Prodr. 11 (1847) 671; Benth., Fl. Aust. 5 (1870) 64; F. Muell., Syst. Cens. Aust. Pl. 1 (1882) 103; Bailey, Synop. Qld Fl. (1883) 381; F. Muell., Sec. Syst. Cens. Aust. Pl. 1 (1889) 173; Bailey, Cat. Indig. & Natur. Pl. Qld (1890) 36; Qld Fl. 4 (1901) 1184; Mold., Résumé Verbenac. etc. (1959) 208; Fifth Summary Verbenac. etc. 1 (1971) 345; Sixth Summary Verbenac. etc. (1980) 334, 348, 384; Baines, Aust. Pl. Gen. (1981) 97.

Lectotype: *J. Banks & D. Solander s.n.*, Endeavour River, Queensland, Australia, 1770 (BM, lectotype designated here!; BM, isolectotype!).

C. cunninghamii Benth., Fl. Aust. 5 (1870) 64, p.p. excl. glabrous syntypes *Daemel s.n.* & *Jardine s.n.* from Cape York, Qld; F. Muell., Syst. Cens. Aust. Pl. 1 (1882) 103; Bailey, Synop. Qld Fl. (1883) 381; F. Muell., Sec. Syst. Cens. Aust. Pl. 1 (1889) 173; Bailey, Cat. Indig. & Natur. Pl. Qld (1890) 36; Qld Fl. 4 (1901) 1184, p.p. excl. glabrous spec. of *Daemel s.n.* & *Jardine s.n.* from Cape York, Qld; Compr. Cat. Qld Pl. (1913) 386, t. XI; Ewart & Davies, Fl. N. Territory (1917) 238; Bakh. in H.J. Lam & Bakh., Bull. Jard. Bot. Buitenzorg, Ser. III, 3 (1921) 89; Mold., Résumé Verbenac. etc. (1959) 200, 207, 208, 215; Backer & Bakh.f., Fl. Java 2 (1965) 607; Mold., Fifth Summary Verbenac. etc. 1 (1971) 335, 345, 358; Court, Cat. Live Pl. Nat. Bot. Gard. Canberra (1980) 81; Mold., Sixth Summary Verbenac. etc. (1980) 325, 334, 339, 348; Baines, Aust. Pl. Gen. (1981) 97; Munir in Morley & Toelken, Fl. Pl. Aust. (1983) 286, 287; Elliot & Jones, Encyc. Aust. Pl. 3 (1984) 48 & t.; Williams, Nat. Pl. Qld 2 (1984) 84, 85 coloured plate; Stanley in Stanley & Ross, Fl. SE Qld 2 (1986) 369, p.p. excl. leaf descrip.: "glabrous"; Dunlop, Vasc. Pl. N. Territory (1987) 79, *syn. nov.*

Lectotype: *A. Cunningham 183*, Goulburn Island South, Northern Territory, Australia, March 1818 (K, lectotype designated here!; BM, K — isolectotypes!); *C. Hulls s.n.*, Escape Cliffs, Northern Territory, Australia, undated (K, MEL 98068, MEL 98070 — syntypes!); *A. Cunningham 80*, Endeavour River, Queensland, Australia, July 1820 (K, MEL — syntypes!).

Typifications

C. costatum is based on a Joseph Banks and Daniel Solander (s.n.) collection from Endeavour River, Queensland. It consists of at least two duplicates, both preserved in Herb. BM. As no holotype was designated by the author a lectotype is selected here. Of the two syntypes, the one with the label "Type Specimen" and the name "*Clerodendrum costatum* R. Br." written on the herbarium sheet seems to be a better representative of this species, and is therefore selected here as the lectotype.

C. cunninghamii Benth. was based on five different collections namely *Cunningham 183* and *C. Hulls s.n.* from Northern Territory, *Cunningham 80*, *Daemel s.n.* and *Jardine s.n.* from Queensland. As no holotype was designated by the author, a lectotype is selected here. All the syntypes were seen and apparently used by the author in preparing the protologue of this species. The author, however, did not realise that out of the five specimens, three tomentose and two glabrous syntypes respectively belong to two different taxa. In the protologue of *C. cunninghamii*, Bentham (1870) described "either quite glabrous or the underside of the leaves and inflorescence more or less tomentose". In reality, the "glabrous" and "tomentose" characters were not present on the same plant, but on different syntypes of *C. cunninghamii* Benth. The glabrous syntypes (*Daemel s.n.* & *Jardine s.n.*, from Cape York Peninsula) are here found to belong to *C. longiflorum* Decne. var. *glabrum* Munir and the tomentose ones to *C. costatum* R. Br. The inflorescence and leaves in the tomentose syntypes are mostly intact and well preserved, while in the glabrous syntypes most flowers have fallen off and the leaves are also no longer connected with the main branch. Since both elements were used in preparing the protologue, the lectotype of *C. cunninghamii* is chosen from the tomentose syntypes. The specimen collected by *Allan Cunningham 183* from Goulburn Island South in the Northern Territory, and now preserved in Kew herbarium, seems to be the best representative of this taxon and is designated here as the lectotype.

Description (Fig. 12)

A shrub or small tree, (1-) 2-5 (-7) m high. *Stem* with a brownish furrowed bark. *Leaves* broadly ovate or elliptic-ovate, acute or obtuse, narrowed at base, (4-) 6-18 (-22) cm long, (2.5-) 4-10 (-15) cm wide, glabrous above, pubescent-tomentose underneath, membranous; petiole pubescent, (10-) 20-50 (-75) mm long. *Inflorescence* a corymb-like thyrse, more or less pubescent-tomentose; peduncle pubescent, primary lateral branches (25-) 50-60 (-80) mm long. *Flowers* pedicellate, numerous in a broad terminal corymb-like dichasium; pedicels pubescent, (3-) 5-10 (-15) mm long. *Calyx* campanulate, 8-12 mm long, puberulus-pubescent outside, glabrous and glandular inside; lobes ovate-lanceolate, or sometimes almost triangular, 3-7 mm long, 3-4 mm wide at base; tube narrowed at base, 3-5 mm long. *Corolla* white, hypocrateriform, glabrous; tube slender, (45-) 50-60 (-70) mm long, 2-3 mm diam.; lobes elliptic-oblong or oblong-obovate, 5-10 (-12) mm long, 2-5 (-7) mm wide. *Stamens* much exserted; filaments inserted above middle of corolla-tube, white, glabrous, filiform, 33-40 mm long; anthers oblong, 2-3 mm long. *Ovary* glabrous, globose, 1-2 mm diam.; style white, much exserted, filiform, glabrous, 60-100 mm long. *Fruit* globose-obovoid, glabrous, purple-black or blue-black, 7-10 mm long, 6-12 mm diam. at top; fruiting calyx dark-red, enlarged, funnel-shaped, shortly contracted at base, margins very spreading or recurved, 20-25 mm diam.

Representative specimens (Collections seen: Australian 70, non-Australian 3)

AUSTRALIA: NORTHERN TERRITORY: *Byrnes 1496*, East Point, Darwin, 16.iv.1969 (BRI, CBG, DNA, NT); *Carolin 6917*, Humpty Doo, 16.v.1968 (SYD); *Chippendale 4496*, Black Jungle, 51.5 km SE Darwin, 27.v.1958 (MEL, NT); *Cunningham 183*, South Goulburn Island, -iii.1818 (K, lectotype; BM, K — isoelectotypes of *C. cunninghamii* Benth.); *Dunlop 3914*, Refuge Bay, Elcho Island, 15.vii.1975 (DNA, NT); *Gulliver s.n.*, Melville Bay, 4.x.1867 (MEL 98076); *Henshall 878*, Peron Island, 28.x.1974 (NT); *Hulls s.n.*, Escape Cliffs, undated (K, MEL 98068, MEL 98070, syntypes of *C. cunninghamii* Benth.); *Lazarides & Adams 298*, near Nourlangie Safari Camp, c. 145 km NNE Pine Creek Township, 22.iii.1965 (CANB, L, NT); *McKean 1360*, Buffalo Creek, 22.iii.1974 (CANB,



Fig. 12. *Clerodendrum costatum* R. Br. (A-D, L.J. Brass 18925: CANB; E, C.R. Dunlop 3914: DNA). A, habit sketch of a flowering branch; B, abaxial leaf surface showing hairiness; C, flower with calyx and corolla longitudinally cut open showing androecium and gynoecium; D, ovary; E, fruit with persistent calyx.

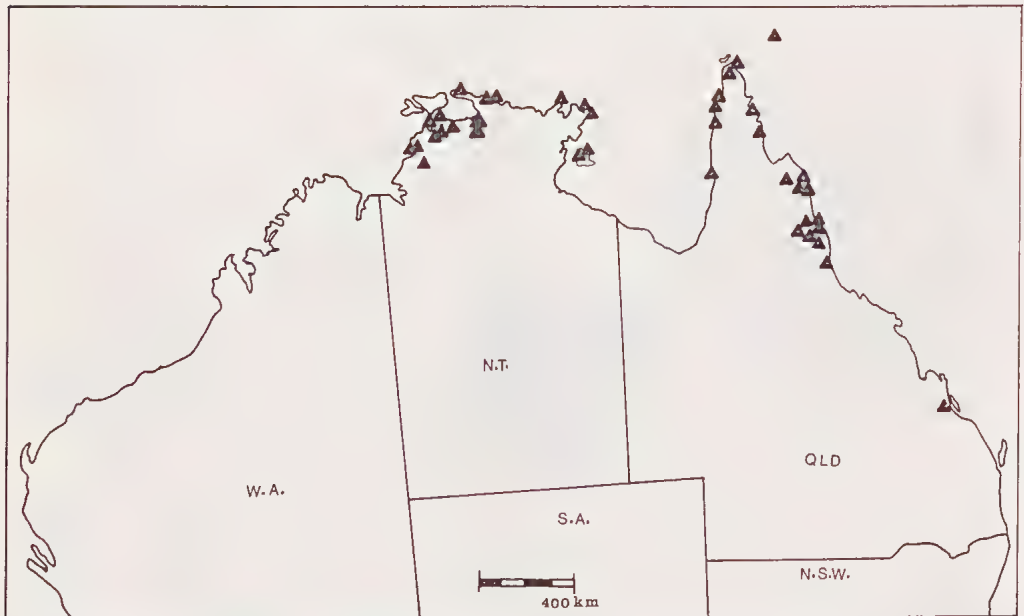
DNA, MO, NT); *Must* 1032, 51.5 km SW Giddy River Crossing, 18.vi.1972 (CANB, DNA, K, NT); *Parker* 691, Berry Springs, 21.ii.1977 (CANB, DNA, NT); *Rankin* 2322 & 2323, Bamboo Pass, Marrakai Track, 30.iv.1980 (DNA, MO); *Robinson* 419, Daly River levee and banks, 12.v.1964 (BRI, CANB, MEL, NT); *Specht* 269, Little Lagoon, Groote Eylandt, Gulf of Carpentaria, 2.iv.1948 (AD, BRI, CANB, L, MEL, PERTH); *Story* 8332, 250 km ENE Darwin, 13.vi.1978 (BRI, CANB, DNA); *Waddy* 566, near Angurugu, Groote Eylandt, 7.x.1976 (DNA, NT); *Wightman* 1923, Murgarella, Brogden Point, 8.vii.1985 (AD, CANB, DNA).

QUEENSLAND: *Bailey s.n.*, Somerset, -vi.1897 (BRI); *Bailey s.n.*, Mapoon, 20.v.1901 (BRI); *Banks & Solander s.n.*, Endeavour River, 1770 (BM, lectotype; BM, isolectotype); *Blake* 23310, Cooktown, mouth of Endeavour River, 16.v.1970 (BRI 2 spec., L, MEL, PERTH); *Blake* 23427, NW Cooktown, near Isabella Falls, 20.v.1970 (BRI); *Brass* 18895, Jardine River, Cape York Peninsula, 20.v.1948 (A, CANB, L); *Brass* 18925, Red Island Point, Endeavour Strait, 23.v.1948 (A, CANB, L, LE); *Dallachy s.n.*, Rockingham Bay, undated (MEL 98452); *Dunlop* 1656, 3.2 km from Iron Range Airport, Cape York Peninsula, 11.vi.1970 (CBG); *Fitzsimon* 64, S.F.R. 755, Barong L.A., 9.ix.1976 (QRS); *Garnett s.n.*, dunes adjacent Edward River Settlement, 20.iv.1980 (JCT); *Heatwole & Cameron* 544, Murray Island, Torres Strait, 17.vii.1974 (QRS); *Stocker* 1504, EP14, Python L.A., S.F.R. 185, Dunbulla, 16.viii.1976 (QRS); *Smith* 10660, Grassy Hill, Cooktown, 28.viii.1959 (BRI, L); *Webb & Tracey* 7144, Galloway Creek, Bamaga, tip of Cape York Peninsula, 1962 (BRI); *Williams* 78091, Andoom, Weipa Area, 12.vi.1978 (BRI).

PAPUA NEW GUINEA: *Brass* 7793, Lake Daviumbu, Middle Fly river, -ix.1936 (A, BRI, CANB); *Brass* 8346, Gaima, Lower Fly River's east bank, -xi.1936 (A, CANB); *Gruttwall* 1503, Raba Raba, Milne Bay district, 20.ix.1965 (BRI, L, LAE).

Distribution and ecology (Map 12)

In Australia, *C. costatum* is known to occur in the tropics of Northern Territory and Queensland. Almost all known localities are in the coastal areas and on nearby off-shore Islands. In Northern Territory, the distribution is restricted between 11° and 14°S and 130° and 137°E. The main occurrence is in the Darwin region, particularly in the areas to the south and south-east of Darwin. It has been collected from several places along the northern coast and also from a few off-shore Islands. In the Gulf of Carpentaria, it has been recorded only from Groote Eylandt. It has not been reported from Arnhem Land where it is most likely to occur.



Map 12. Distribution of *C. costatum* ▲.

Distribution in Queensland is mainly in the coastal areas of Cape York Peninsula where it occurs from Atherton Tableland northwards to the tip of the Peninsula. On the Gulf side, it occurs as far south as Edward River. The only two records outside Cape York Peninsula are one from Murray Island in the Torres Strait and another from near Rockhampton along the eastern coast. This species has not been reported from the interior of Queensland.

Collections from Papua New Guinea are the only ones examined from outside Australia.

According to Moldenke (1959, 1971, 1980) this species has been cultivated in British Guyana, England, Java and Mozambique.

Growing usually on coarse sandy or rocky soils, but also recorded from loam. Often on banks of creeks or rivers, or coastal sand dunes and associated with "savannah mixed open forest" and "rainforest".

Comments

Due to lack of flowers in the type of *C. costatum*, very little effort was made in the past in comparing its leaves and infructescence with *C. cunninghamii* which is now regarded as synonymous. Bakhuizen (1921) for the first time recognised *C. cunninghamii* and *C. costatum* as conspecific. However, he erroneously placed the earlier validly published *C. costatum* in the synonymy of *C. cunninghamii*.

The leaf length of *C. costatum* was recorded by Bentham (1870) as "4 to 5 lines long", i.e. 8.4 to 10.5 mm long. This is far too short for the big leaves of this species. Perhaps the word "lines" was a misprint for "inches" which agrees more closely with the known leaf-length of *C. costatum*.

Of all the Australian taxa of *Clerodendrum*, *C. costatum* R. Br. (= *C. cunninghamii* Benth.) and *C. longiflorum* Decne. have the longest corolla-tube, measuring 45 to 80 mm in length.

Two collections from Endeavour River, Blake 23310 and Persieh s.n. (MEL 98106) have somewhat more dense indumentum on the abaxial surface of their leaf-blades, thinly pubescent on the adaxial leaf surface and outside the corolla-lobes. In all other characters, these collections fall well into the range of variation of this species. Sticks of this species are used by the natives for making fire according to Ewart & Davies (1917).

Affinities

Amongst Australian *Clerodendrum* species, *C. costatum* and *C. longiflorum* Decne. var. *glabrum* Munir are so similar that most Australian collections of *C. longiflorum* var. *glabrum* were identified as "*C. cunninghamii* Benth." The latter is synonymous with *C. costatum*. Both *C. costatum* and *C. longiflorum* var. *glabrum* have similar-shaped large leaves, the longest flowers of all Australian *Clerodendrum* species, a white corolla with a slender glabrous tube, glabrous and glandular on the inner surface of the calyx. *C. costatum* is easily identified by its leaf-blades being pubescent-tomentose underneath; petioles, peduncles, pedicels and outside of calyces are also pubescent. In *C. longiflorum* var. *glabrum*, the leaves, peduncles and flowers are completely glabrous.

C. costatum has several characters common with *C. tracyanum* such as the leaf-blades are pubescent-tomentose at least on the abaxial surface; petioles, peduncles, pedicels and the outside of calyces are pubescent. *C. tracyanum*, however, can be distinguished by its leaf-blades being velvety-pubescent on both surfaces and have a cordate base; the inflorescence is not exceeding the upper leaves; flowers much shorter, up to 10 mm long; calyx- and corolla-tubes have sparse gland-tipped hairs inside; the filaments and the style are hardly $\frac{1}{4}$ of the length of those of *C. costatum*.

In several characters, *C. costatum* is nearer to *C. tomentosum* (Vent.) R. Br. and *C. grayi* Munir (see "Affinities" under each of these species).

10. *Clerodendrum grayi* Munir, sp. nov.

Frutex elatus vel arbor parva, 3-5 m alta. *Caulis* erectus, ramosus, cylindricus, alto pectoris \pm 6 m diametro; ramuli brunneoli, pubescenti-tomentosi. *Folia* oblonga vel anguste elliptico-oblonga, obtusa vel obtuse acuta, basi subrotundata, integra, (6-) 10-18 (-20) cm longa, (2-) 4-8 (-19) cm lata, superne puberula, infra pubescenti-tomentulosa, chartacea; petioli ferrugineo-pubescentes vel tomentosi, (1.5-) 2.5-5.5 (-7) cm longi. *Inflorescentia* thyrsus terminalis corymbosus, plus minusve pubescenti-tomentosus; pedunculus pubescenti-tomentosus, ramulis primariis lateralibus, 3-6 cm longis. *Flores* laxi, pedicellati; pedicelli pubescentes, 4-10 (-13) mm longi. *Calyx* campanulatus, 8-13 mm longus, extra pubescens, intra glaber et sparsim glandulosus; lobi triangulari-lanceolati, acuti, 5-9 mm longi, 3-4 mm lati. *Corolla* alba, hypocrateriformis, glabra sed tubo extra glanduloso, intra glabra, lobis extra puberulis; lobi oblongi vel elliptico-oblongi, 8-11 mm longi, (3-) 4-6 mm lati; tubus tenuis, subcylindricus, (25-) 30-35 (-40) mm longus, 1-1.5 mm diametro. *Stamina* multo exserta, super medium tubi corollae inserta; filamenta alba, filiformia, glabra, 30-35 mm longa; antherae oblongae, \pm 2 mm longae. *Ovarium* glabrum, globosum, ad apicem leviter 4-lobatum, 1-1.5 mm longum; stylus albus, multo exsertus, filiformis, glaber, 60-75 mm longus. *Fructus* globulo-obovoideus, glaber, 7-10 mm longus, ad apicem 6-8 (-10) mm diametro; calyx fructu purpureo-ruber vel atro-ruber, accrescens, infundibuliformis, patens, 20-25 mm diametro.

Type: B. Gray 1327, Upper Barron River, Kennedy Highway, lat. 17° 25'S, long. 145° 31'E, Queensland, Australia, 12.iii.1979 (AD, holotype; QRS, isotype).

Description (Fig. 13)

A tall shrub or small tree, "3-5 m high". *Stem* erect, branched, cylindrical, \pm 6 cm diam. at breast height; branchlets brownish, pubescent-tomentose. *Leaves* oblong or narrowly elliptic-oblong, obtuse or bluntly acute, somewhat rounded at base, entire, (6-) 10-18 (-20) cm long, (2-) 4-8 (-9) cm wide, puberulus above, pubescent-tomentulose below, chartaceous; petioles rusty-pubescent or tomentose, (1.5-) 2.5-5.5 (-7) cm long. *Inflorescence* a terminal corymbose thyrses, more or less pubescent-tomentose; peduncle pubescent-tomentose, primary lateral branches 3-6 cm long. *Flowers* lax, pedicellate; pedicels pubescent, 4-10 (-13) mm long. *Calyx* campanulate, 8-13 mm long, pubescent outside, glabrous and sparsely glandular inside; lobes triangular-lanceolate, acute, 5-9 mm long, 2.5-3.5 mm wide at base; tube narrowed at base, 3-4 mm long. *Corolla* white, hypocrateriform, glabrous but glandular outside tube, glabrous inside, puberulous outside lobes; lobes oblong or elliptic-oblong, 8-11 mm long, (3-) 4-6 mm wide; tube slender, almost cylindrical, (25-) 30-35 (-40) mm long, 1-1.5 mm diameter. *Stamens* much exserted; filaments inserted above middle of corolla-tube, white, filiform, glabrous, 30-35 mm long; anthers oblong, \pm 2 mm long. *Ovary* glabrous, globose, faintly 4-lobed at top, 1-1.5 mm diam.; style white, much exserted, filiform, glabrous, 60-75 mm long. *Fruit* globular-obovoid, glabrous, 7-10 mm long, 6-8 (-10) mm diam. at top end; fruiting calyx purplish-red or dark-red, accrescent, funnel-shaped, spreading, 20-25 mm diam.

Specimens examined

AUSTRALIA: QUEENSLAND: B. Gray 1327, Upper Barron River, Kennedy Highway, 17°25'S, 145°31'E, 12.iii.1979 (AD holotype, QRS); K. Sanderson 143, S.F.R. 185, Robson L.A., E.P.9 sub-plot A, 17°10'S, 145°35'E, 31.v.1972 (QRS); J. Tracy 14739, Davies Creek, Forestry Road, S.F. 607, 17°04'S, 145°34'E, -viii-ix.1971 (QRS).

Distribution and ecology (Map 3)

C. grayi seems to be endemic to the northern part of Queensland in Australia. The present known distribution is on Atherton Tableland with all localities to the south-south-east of Mareeba. So far, it seems restricted between latitudes 17° and 18°S, and longitudes 145° and 146°E.

Recorded as understorey in rainforest, growing "on soil derived from granite".

Comments

This species is named after Mr B. Gray, a collector at Herb. QRS. Previously, this species had been misidentified as *C. cunninghamii* Benth. which has a more or less similar

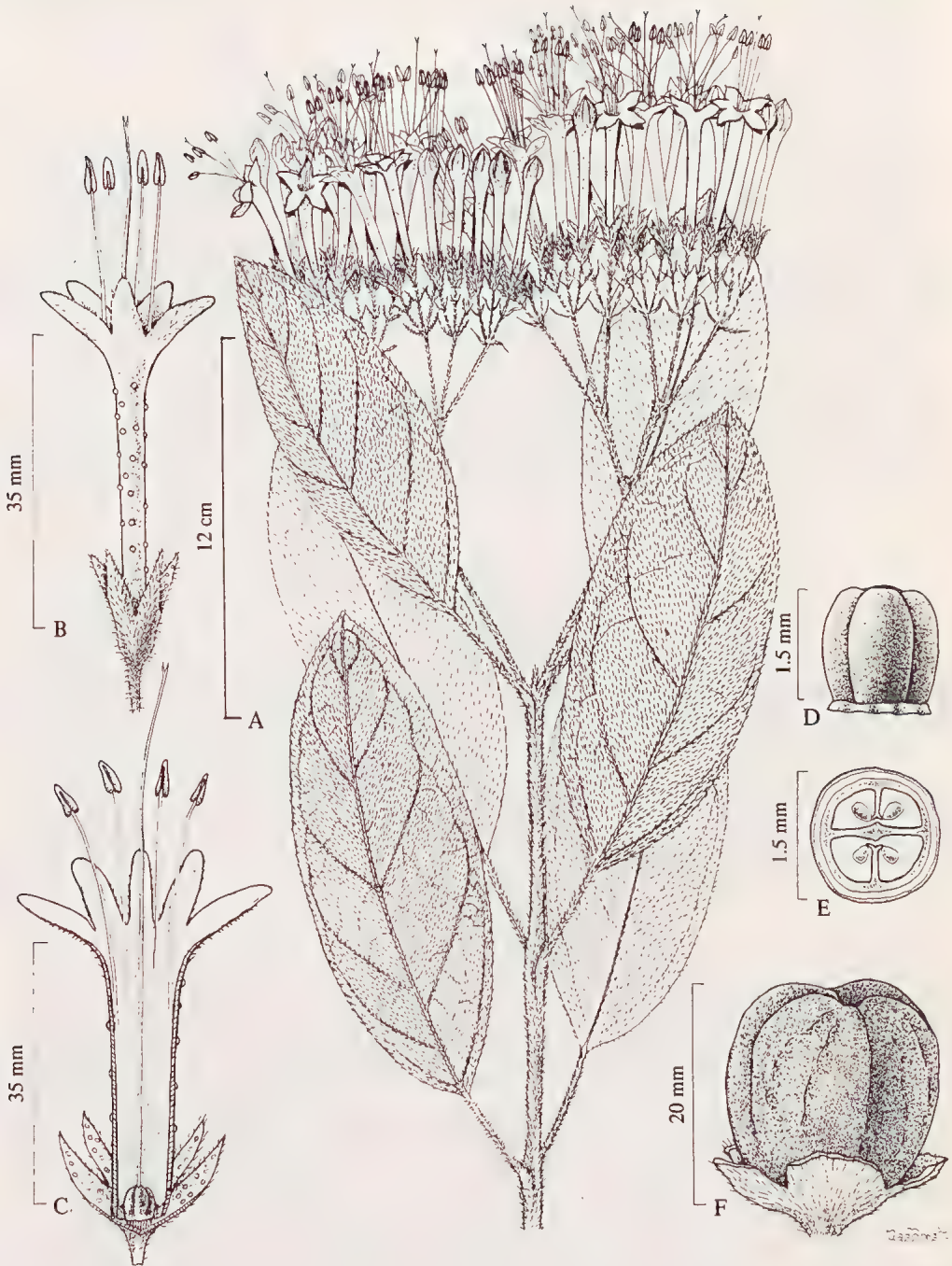


Fig. 13. *Clerodendrum grayi* Munir (A-F, B. Gray 1327: AD, holotype). A, habit sketch of a flowering branch; B, flower showing external features; C, flower with calyx and corolla vertically cut open showing androecium, gynoecium and glabrous inside; D, ovary; E, transverse section of ovary; F, fruit with persistent calyx.

inflorescence and overlaps the range of distribution of that species on Atherton Tableland. *C. cunninghamii*, may easily be distinguished by the ovate leaves and much longer corolla-tube.

Affinities

C. grayi closely resembles *C. costatum* in its leaves being pubescent below; inflorescence of similar corymbose appearance; sepals pubescent outside, glabrous and glandular inside; petals, androecium and gynoecium glabrous. The latter, is, however, easily distinguished by its leaf-blade being ovate, narrowing towards the base, glabrous adaxially; corolla-tube much longer (45-70 mm), not glandular outside; corolla-lobes not puberulous outside. Moreover, *C. grayi* is restricted to only a small area on Atherton Tableland, while *C. costatum* is widely distributed along the northern coast of Queensland and Northern Territory, and is also found on several off-shore islands in the Gulf of Carpentaria and Torres Strait.

C. grayi has a few characters common with *C. tomentosum* (Vent.) R. Br. Both species have leaves and inflorescence pubescent-tomentose; calyx pubescent outside, glabrous and glandular inside; corolla-tube glabrous inside; androecium and gynoecium glabrous. *C. tomentosum*, however, may readily be distinguished by its leaves and inflorescence being much more densely pubescent-tomentose; inflorescence much more compact; corolla pubescent outside.

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